Products finishing

FRED W. VOGEL, Editor

Volume 5 MAY, 1941 Number 8

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Products Finishing

HARDLY an industry is operating today which has not felt the upsurge of increased business and at the same time has felt the pangs of material curtailment due to priorities, and yet the present program of defense production is only beginning. One problem that must be faced eventually by those industries engaged in non-defense work at the present time—and there are many in the finishing field—will be the curtailment of non-defense production to permit the possible addition of actual defense work.

Changing over to the manufacture of defense items will necessitate changes both in finishing procedure and equipment. Since it appears now that many changes are imminent, it would seem only logical for those in charge of finishing departments to make complete check-ups and inventories of available facilities including equipment, materials, labor, and so on, in the plant. The recording of such information should be as accurate as possible and will be of invaluable assistance to those who must design and plan production schedules to accommodate changes of product.

If our government is to attain maximum speed in rearming, every bit of manufacturing equipment throughout the country must be available for service either on prime contracts or subcontracts. While the prime contracts will go first, of course, to large plants where the managerial, engineering, and factory personnel are available to translate large orders into terms of plant facilities, man power, and materials, there are thousands of smaller plants that can take part in this program by subcontracting the manufacture of parts for which they are equipped. Every manufacturer should contact his regional defense office at the nearest Federal Reserve Bank or branch bank to give that office an inventory of his equipment and facilities in order that he may take an active part in this emergency work.

MAY, 1941 Vol. 5, No. 8

Finishing Service

By FRED W. VOGEL

MODERN service merchandising methods are essential to the success of any business today and that includes the automobile service shop. Every car owner knows that his car needs oiling and greasing at regular intervals but the shop that gets the business is the one that asks him for it. Further, he needs to be reminded regularly that lubrication of his car is important if his car is going to function properly.

Sensing the opportunity thus presented, the Lincoln Engineering Co., St. Louis, Missouri, developed a line of "service merchandisers" and lubricating equipment which help the automobile service shop to merchandise its lubrication service as well as other service such as "Brake Serv-

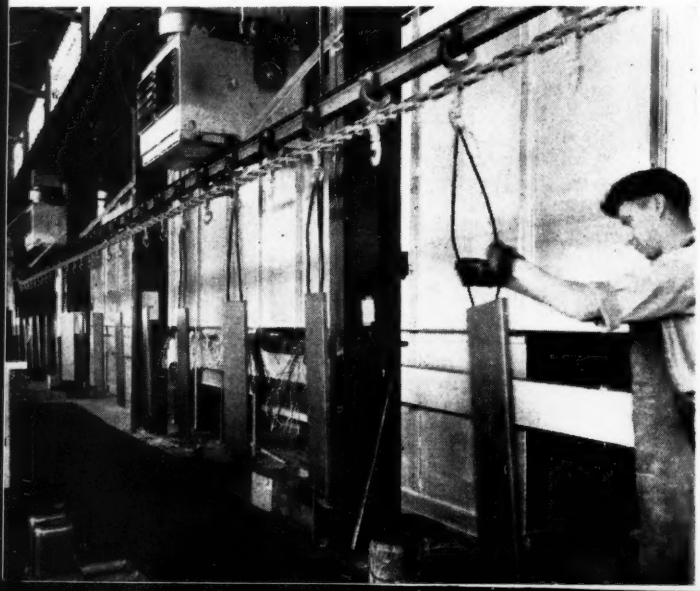

Fig. 1 — Panels are hung on the monorail conveyor by the workman shown in this illustration.

ishing Automobile ervice Equipment

The conveyorized finishing system described herewith features operations which are coordinated to meet the demands of high quality and high production.

ice," "Motor Tune Up," and so on. The service merchandiser is an all-in-one practical unit which puts showmanship and eye-appeal into the merchandising of automobile service. These units have been designed to harmonize with the lubrication equipment and like the lubrication equipment they are highly practical units.

Principally, the service merchandiser consists of an all steel work bench flanked on either side by cabinets for tools and equipment. In the manufacture and finishing of these units, special emphasis has been placed upon appearance with the result that they are contoured to the latest accepted standards in streamline designing and are finished in attractive, blending color schemes.

This article is devoted to the operations required to transform the greasy, dull colored steel sheets as they are obtained from the fabricating department into gleaming white panels for the service merchandiser.

•

In the Lincoln Engineering plant, where the most modern equipment obtainable for the finishing of metal products is employed, we find an excellent example of efficient, straight line production. The arrangement of processing equipment to facilitate handling of work, synchronization of the various finishing processes to meet fabrication and assembly department requirements, and close supervision are but a few of the features that enable this plant to maintain quality production.

The background panels of the service merchandisers are fabricated in

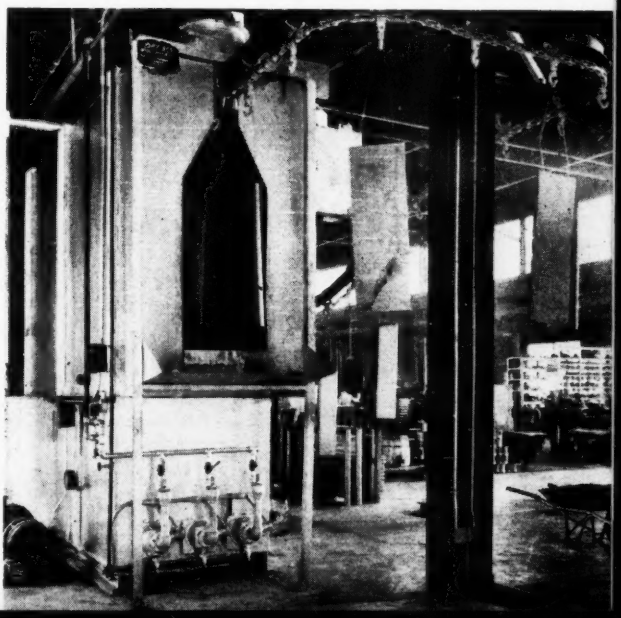

Fig. 2—The first operation to which the panels are subjected consists of a thorough spray washing in the cabinet shown here.

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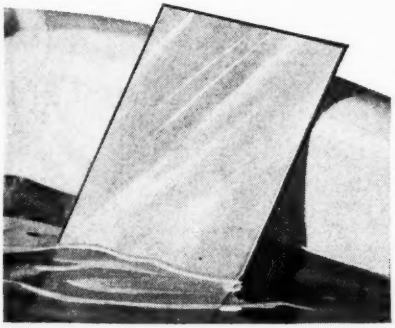

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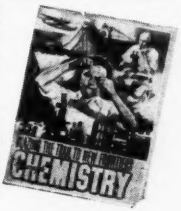

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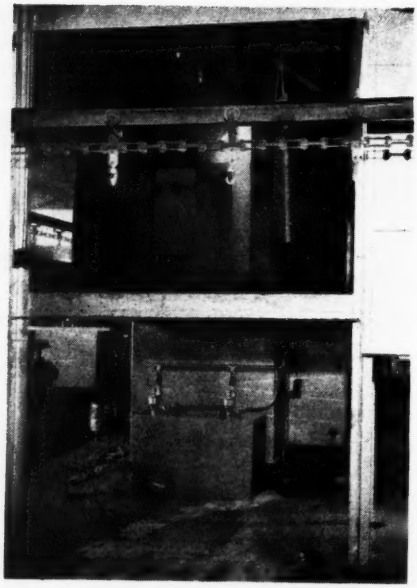

Fig. 3—The panels are visible to the operator as they pass from the acid sealing spray into the drying oven.

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several standard sizes which range from 6 in. by 60 in. to 30 in. by 36 in. These panels are stacked according to the size and quantity required in a storage bay which is located adjacent to the finishing department from which a constant flow of panels to the processing department is assured through the use of an overhead monorail conveyor system. As the workman shown in Fig. 1 places a panel on the overhead conveyor, he carefully inspects the panel surface for possible fabrication defects or imperfections in the metal. The illustration also shows a side view of the Dry-Sys metal finishing "prepation" unit, in addition to showing part of the storage bay and the overhead conveyor.

Illustration Fig. 2 shows the panels entering the cleaning end of the finishing system. The metal preparation sequence through which the workpieces pass is totally enclosed in a cabinet approximately 83 ft. long—a length sufficient to house a tank of cleaning solution, spray rinse equipment, and so on, with which the metal surface of each panel is prepared for coatings of finishing material. The sequence followed in the metal preparation unit is cleaning, rinsing, Bonderizing, acid spraying, and drying.

The cleaning solution, consisting primarily of an alkali compound, is sprayed onto the workpieces through pipes which line the interior of the cabinet shown in Fig. 2. Complete removal of the drawing compounds

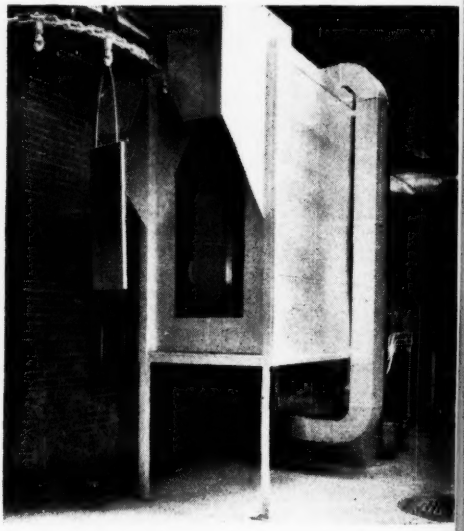

Fig. 4—This illustration shows a view of the exit end of the drying oven.

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328

Fig. 5—Tack ragging each panel before spraying with finishing material assures work free from dust particles.

•

used in the press shop during the forming operations is assured through the use of the alkali spray. As the panels pass out of the alkali cleaning solution section, they are subjected to a thorough water spray rinsing which removes excess alkali cleaning solution. A Bonderizing solution spray follows the rinse. The Bonderizing solution provides the metal panels with a rust - preventing coating which has a texture that increases the adhesion and durability of the finishing material which will be later applied over the coating. The time interval during which the panels are subjected to the Bonderizing solution is held to a minimum of 60 seconds. Following this, they receive a "sealing" spray of chromic acid.

As the panels emerge from the chromic acid spray, they are visible to the operator through the preparation cabinet unit opening shown in Fig. 3 which makes it possible for him to see whether or not they have been properly prepared by the process through which they have just passed. If they have, they are permitted to pass into a drying compartment which is located at a right angle to the metal preparation section and extends for 21 ft. into the

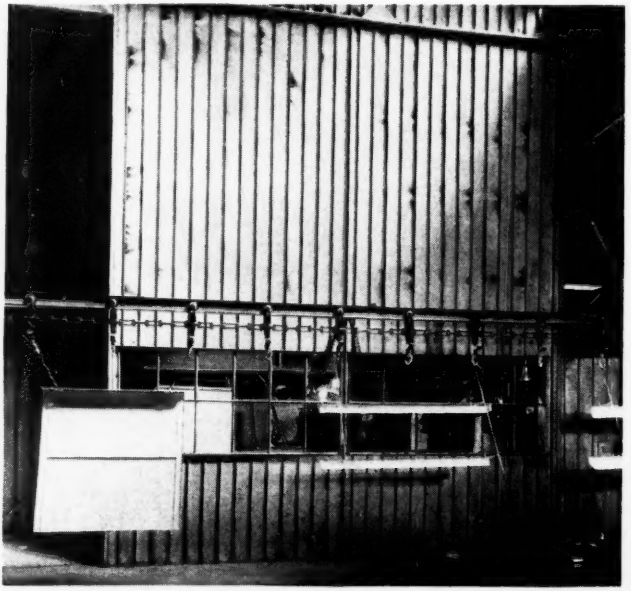

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Fig. 6—Exterior view of the fully enclosed, air conditioned spray booth.

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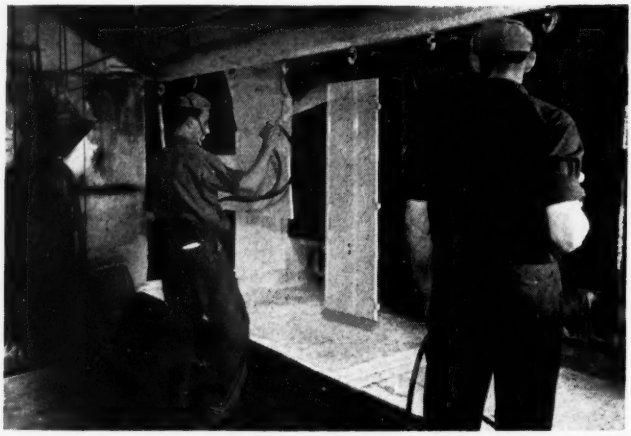

Fig. 7—Interior view of the spray booth showing operator in position for spraying workpieces.

main section of the finishing department. This dryer is heated with gas and is maintained at a temperature of 300 deg. At the exit end of the oven the panels emerge dry as shown in Fig. 4.

An interval of time elapses during which the panels are permitted to cool to approximately room temperature so that they can be tack ragged to remove all traces of lint and dust that may have collected on the panels during their passage through the drying oven. During the tack ragging, the panels remain suspended from the traveling overhead conveyor and the operator rubs completely over the two sides of the panel as shown in Fig. 5. Since the appearance of the final finished surface depends so much upon the cleanliness of the base surface, the extra precaution-

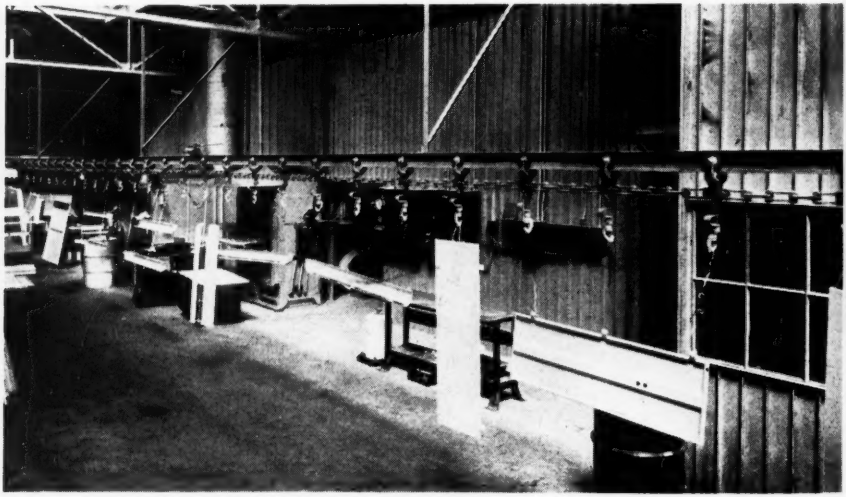

Fig. 8—An exterior view of the finish baking oven showing the heating equipment and heat control instrument panel board.

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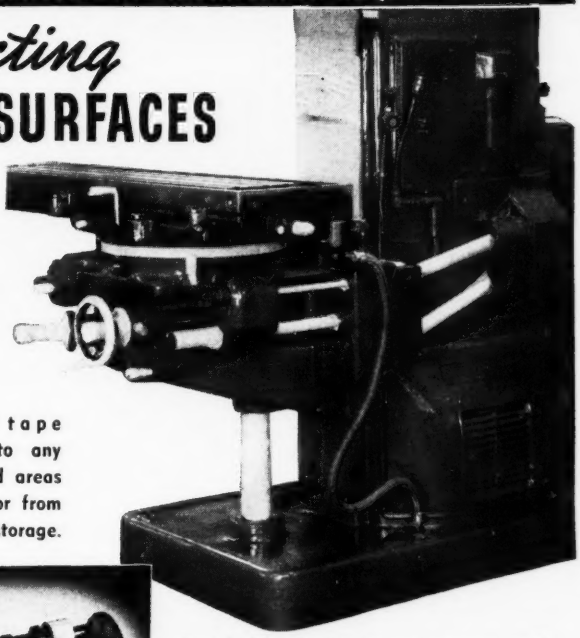

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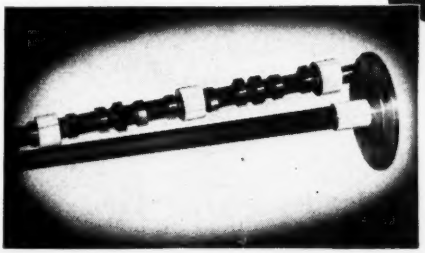

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ary step of tacking with Magic tack rags is considered one of the most important preparatory steps in this finishing setup.

The conveyor which carried the panels into the preparatory system

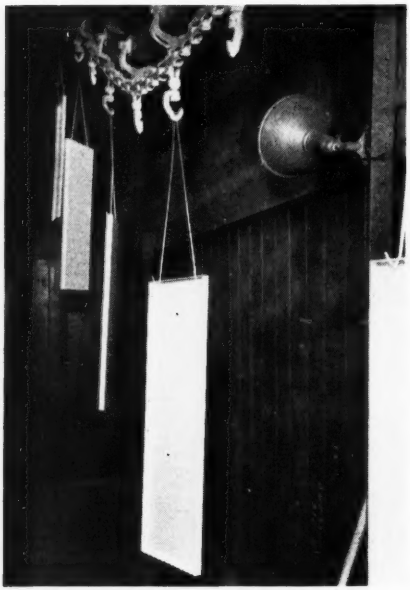

Fig. 9—After baking, the panels pass through the exit end of the baking oven as shown in this illustration.

also conveys the panels into the finish application section. A view of the glass-enclosed, air conditioned spray booth which is the main piece of equipment of the finish application section is shown in Fig. 6. An excess of air pressure is maintained inside the spray booth to prevent dust from entering through any of the openings in the booth and also to aid in the removal of paint fumes.

A water wash spray booth of the latest design, as illustrated in Fig. 7, is located inside the metal and glass enclosure shown in Fig. 6. At this booth, each of two spray gun operators directs a flow of finishing material toward the workpieces as they move by, still suspended from the traveling overhead conveyor. The excess spray, or over-spray, strikes a water curtain provided at the rear of the booth and is carried downward into a trough located at the bottom. From the trough, the excess finishing material may be skimmed off and reclaimed for further use or it may be discarded, depending upon the value of the material used. Explosion-proof lights, latest type DeVilbiss spray guns, and adequate ventilation are additional features of this spray booth setup.

For the finishing schedule of the panels, one operator applies a light or base coating which is used merely to cover the work and is compounded to set very rapidly. The setting takes place so rapidly that a second spray gun operator in the same booth has sufficient time in which to apply a much heavier coating of Ault-Wiborg Polymerin before the workpieces pass beyond the limits of the booth and into the baking oven. A view of the oven in which the finished workpieces are "flash" baked is shown in Fig. 8.

The term flash baking has been applied due to the fact that the baking interval has been reduced to a relatively short time. During baking, the workpieces are conveyed into an upper section of the oven where the temperature is maintained at 312 deg. F. After remaining in this section for approximately one minute, a chemical change in the composition of the finishing material takes place. The material is almost instantaneously "polymerized" or converted from the semi-liquid to a solid state and in this form the finish is abrasion resistant, smooth, and hard. An even temperature is obtained efficiently and economically by means of the R.

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Following the finish baking, the workpieces emerge from the oven as shown in Fig. 9. From this point, the panels are carried to a section of the finishing department where each

Fig. 10 — Every panel that passes from the baking oven is carefully examined by the inspector shown here.

piece is carefully examined under the critical eye of a trained inspector as shown in Fig. 10. If the finished panels meet with the inspector's approval, they are removed from the conveyor and placed in tote boxes for transfer to the assembly department. The very few pieces that do not pass inspection are removed from the conveyor, stripped and reworked.

The completely automatic finishing system just described, with all operations coordinated to meet the demands of high quality and high production, is filling the present-day need for economical and efficient finishing procedure.

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Relation of Galvanizing Bath Temperature to Iron Content of Dross

By WALLACE G. IMHOFF

President, The Wallace G. Imhoff Co., Vineland, N. J.

MANY research investigations have been made to determine the relation between the temperature of the galvanizing bath, and the destruction of the galvanizing pot. The chemical action of molten zinc upon various kinds of steel bases have also been studied, and much has been learned as to the manner in which the various chemical elements in the steel base accelerate or retard the dissolving action of the molten zinc upon the iron. These investigations have all had their effect upon the progress made in the science of galvanizing engineering in the past few years.

Relation of Bath Temperature and Dross Production

It has been known in practice almost since the beginning of hot-dip galvanizing, that there was a definite relation between the galvanizing bath temperature, and the amounts of dross made. In the old coke-fired pots, when the fires got too hot during the night, this fact was reflected in the large quantity of dross found in the pot in the morning. In those days few galvanizing furnaces had any kind of temperature equipment to show the bath temperature, and in many plants even during the operating period in the day time, the regulation of the galvanizing bath temperature was left to the judgment of the galvanizer who had charge of the pot. Accurate temperature relations were not known, but experience had indicated that overheating the bath not only produced excessive amounts of dross, but it also often burned out the pots.

Old Practice of Sweating Dross

At this time it was also general practice to remove the dross from the galvanizing pot, and then treat it in another smaller pot by heating it considerably above the melting point of zinc, and then decanting off the liquid metal which came to the top. These sweating pots in some instances were run very hot, since it seemed that the higher the bath temperature was carried, the more zinc could be decanted off. In one plant the writer watched metal being decanted from a bath that was at a dull red heat.

Dross Makes Dross

There was a common saying among galvanizers that "dross makes dross." This idea had good grounds, and had developed from the practical facts that the higher the bath temperature reached, the more dross was made, and the more dross that was made, the higher the bath temperature had to be raised to keep the metal molten. Actual cases were found where inexperienced galvanizers had kept up the spiral of temperature and making more dross, until the entire galvanizing bath was turned to dross, and the pot burned out.

As the dross takes up more iron, the temperature must be raised to keep the bath molten, and the higher the temperature of the bath is raised, the more dross is made, and the higher the iron content of the dross. The only remedy for such a situation is to remove the dross from the pot, and immediately put in fresh zinc, and then lower the bath temperature, then let the bath settle, dross again, and put in more zinc, and lower the temperature again. If the pot is almost full of dross the best thing to do may be to dip out all of the metal and fill the entire pot with new zinc. The old metal which has been slabbed may be used a very little at a time until it has all been reclaimed.

Temperature Relation to Iron Content

Some queer things seemed to happen when the metal from the dross sweating pots was again used. For example, in one plant the galvanizing pot was drossed in the usual manner on Saturday, and new metal added to replace the loss due to drossing. It just so happened that there was a shortage of new prime western slab zinc, and so to replace this shortage,

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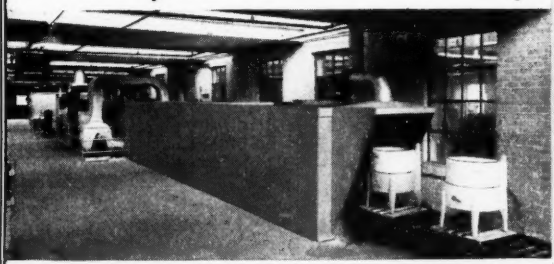

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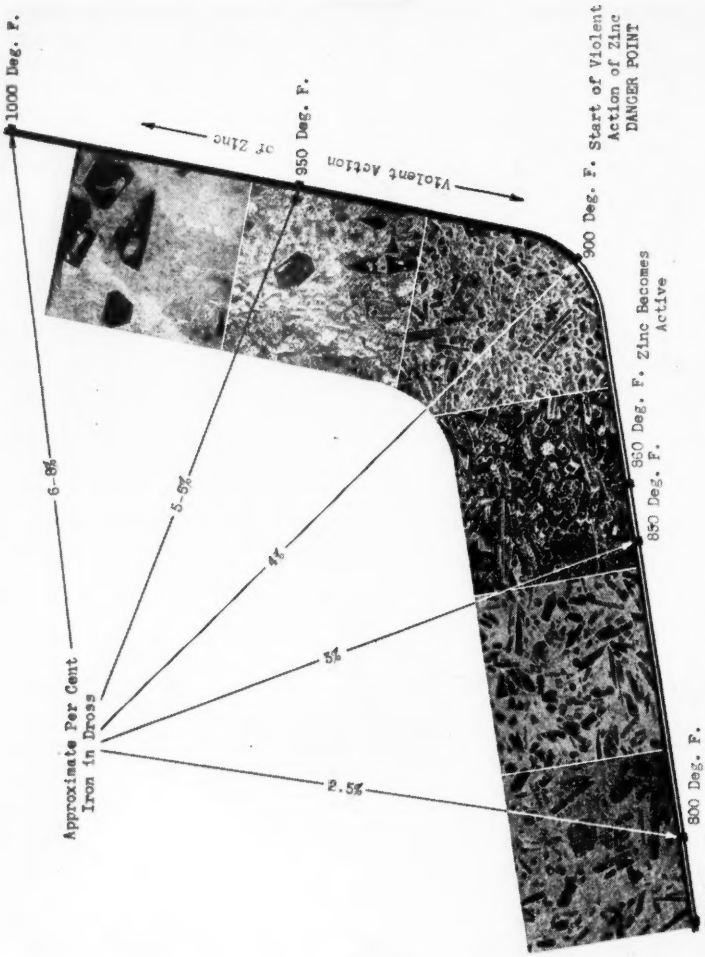

Fig. 1—Temperature of the galvanizing bath curve in relation to the iron content of the dross.

much more of the reclaimed zinc from the sweating pot was used. The galvanizing bath was drossed absolutely clean on Saturday, and to the great surprise of everyone, the pot was found to be over half full of dross on Monday morning before operations started. It was recalled that an unusually large amount of the sweated metal had been charged in after drossing on Saturday, and the formation of the large quantity of new dross from Saturday to Monday without the pot being in operation was definitely attributed to the sweated zinc used.

Actual chemical analyses of such sweated zinc was made in another

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Fig. 1—Temperature of the galvanizing bath curve in relation to the iron content of the dross.

plant at a later date, and the iron content of different samples of the zinc decanted was found to reach as high as 2.50 per cent iron. Research investigations were then conducted to discover the relation of the bath temperature to the iron content of the dross, and when these investigations were completed, it was recommended that the sweating pots be eliminated as actual dross makers. It was found to be really true, that dross does make dross, and this is because the dross made at high bath temperatures changes in form when put back into the galvanizing bath at low temperatures, and the change in form from one kind of dross to another, is accompanied by the taking up of large amounts of good zinc into combination with the iron at the lower bath temperature.

A visual picture of what happens may be had by comparing it to a sponge squeezed tightly in the palm of the hand, and then lowered into water and the hand opened. As the sponge is freed it immediately swells and takes up water. About the same thing happens when dross at a high bath temperature is placed in a galvanizing bath at a low bath temperature. The zinc-iron alloy readjusts itself to form a new alloy much richer in zinc, and this zinc is taken up from the galvanizing bath. The amount of dross is therefore greatly increased, and the small amount of dross at a high temperature makes much more dross, at a low temperature.

Dross Makeup

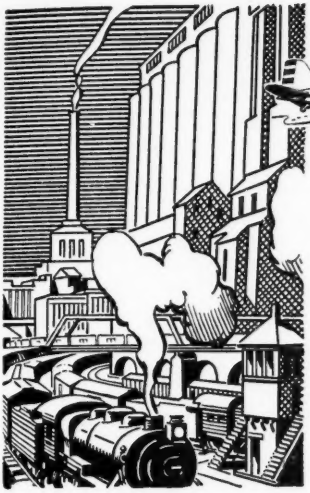
Dross in the galvanizing pot is thought of as zinc-iron alloy crystals that have settled to the bottom of the pot. However, it is not possible in practice to get these crystals out of the bath without carrying out large amounts of the bath along with the crystals. So galvanizer's dross out of the bath consists of zinc-iron alloy crystals with galvanizing bath frozen between them. A similar condition is seen in a "water soaked" snow ball. The water is held with the snow.

When a piece of galvanizer's dross is viewed under a microscope the zinc-iron alloy crystals are seen to be long slender needles in heavy black, and the galvanizing bath is seen as a lighter color between, or around these black zinc-iron alloy crystals. It is apparent therefore that there are two distinct components present; namely, the lighter bath, and the darker crystals.

Methods of Increasing the Iron Content of the Dross

The higher the galvanizing bath temperature, the tighter the dross crystals pack together at the bottom of the pot. Thus, there is less bath metal, and more crystals. This gives a dross higher in iron content. The average galvanizing bath temperature is about 860 degrees F., and if the temperature in the dross is higher it may be assumed to be around 875 to 900 degrees F. The temperature in the dross should never be over 900 degrees under any consideration, and the right temperature in the dross is about 875 degrees F. This will produce dross with an iron content of about 3.75 per cent iron.

The other method of increasing the iron content of the dross is to pack the crystals closer together after the dross has been removed from the galvanizing bath. The vital condition is the time element between the time the dross is brought out of the bath, and the solidification of the dross when it has reached a temperature low enough to freeze it, and trap the bath around the crystals in the solid



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dross. The usual method employed to get the bath out when dross comes out of the bath is to take a shovel and cut and slice the dross. Paths are cut through the mass, but the metal can only escape in these paths. The method is very slow, very inefficient, and most of the metal is frozen in with the dross crystals.

The more modern method is to vibrate the dross with a piece of equipment that resembles an air hammer. The vibrator is placed on the handle of the dross spoon, or on the side of the scoop, and the air pressure vibrates the spoon, thus quickly freeing all of the molten metal from between the zinc-iron alloy crystals. From 15 to 20 per cent more good metal is recovered with this equipment over the old hand methods of cutting and slicing the dross. Since the time element is the important factor, and the dross vibrator vibrates the entire dross in the spoon, the good metal pours out from between all of the crystals at once, instead of just out through the small narrow cut made by a shovel.

Iron Content of the Dross Found To Be a Function of the Bath Temperature

Only a few years ago, it would have been deemed impossible to tell the temperature of a galvanizing bath without seeing the furnace. Study of the relation between bath temperature and dross has revealed two extremely interesting things—namely, that the iron content of the dross increases with the increase in temperature, and second that the crystal form of the dross changes at about 900 degrees F. to another form. Since other factors come into play, such as, for example, the amount of iron available, or iron saturation, the iron content of the dross is not definite for each temperature. However, it is approximate, and the bath temperature can be estimated within certain practical limits. We can give a very rough table showing the relation between the bath temperature, and the iron content dross which can be used, along with other factors to determine the heat in the bottom of the pot. These approximate values are as follows:

Temperature of Bath Degrees F.	Approximate Iron Content of Dross Per Cent
800	2.50
850	3.00
900	4.00
950	5.00-6.00
1000	6.00-8.00

Character of Dross at Different Temperatures

If we examine various actual practical dross samples at different galvanizing bath temperatures under the microscope we find some very interesting things. At the low bath temperatures the zinc-iron alloy crystals are very distinct, and are far apart, and have much bath around them. This is why the iron content of the dross is from 2.50 to 3.50 per cent. The amount of the bath between the crystals and the crystal form itself tend to keep the iron content low. The zinc-iron alloy crystals are longer, slender rhombohedral crystals, of the hexagonal system, and the zinc is large in amount that is chemically combined with the iron present.

As the bath temperature rises, the zinc-iron alloy compound readjusts itself to the higher temperature by releasing some of the zinc, and thereby automatically the iron content of the crystal is raised. The new compound contains the same iron but less zinc.

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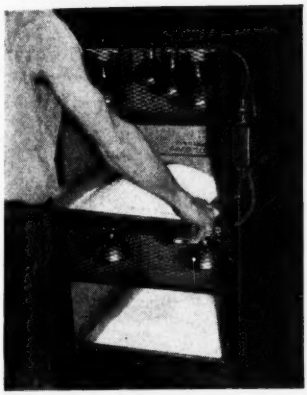

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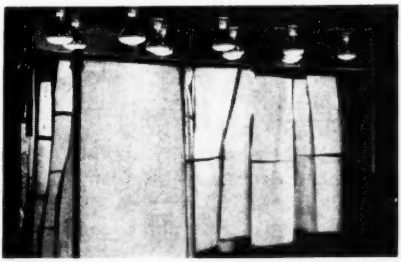

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This readjustment, always losing zinc as the bath temperature rises, goes on until 900 degrees F. is reached. In addition to crystal readjustment, the crystals pack tighter together with rise of bath temperature. These facts and conditions are plainly to be seen in the illustration Fig. 1 showing the microstructure of the dross for each bath temperature. The combination of packing the crystals tighter together, and the readjustment of the zinc-iron alloy itself as a chemical compound, always increasing the iron content with every rise of temperature, tends to show that the iron content of the dross increases directly with the rise of bath temperature. It will be noted how much closer the crystals are together in the dross at 900 degrees F., than they are at 800 degrees F.

Heat Must Not Be Applied to the Bottom of the Pot

Since a chemical analysis of dross shows it to be mostly zinc, it can readily be appreciated that if heat is applied to the bottom of the galvanizing pot the heat currents upward may pick up the dross and carry it up into the galvanizing bath where it will get onto the work going through the bath. This has actually happened in many cases. The specific gravity of zinc as given by one authority is 7.19. Thus, if the dross has a lower specific gravity it may float; if higher it will sink to the bottom of the pot. Some dross in one plant was found to have a specific gravity of 6.95 (this dross floats and comes up in the galvanizing bath); in another plant the dross had a specific gravity of 7.38 (this dross is heavier than zinc and thus settled to the bottom of the pot). As a result of these tests it was found:

1. The higher the bath temperature, the greater the quantity of dross produced.

2. The higher the temperature, the higher the iron content of the dross.

3. The higher the temperature, the greater the specific gravity of the dross.

Crystal Form of the Dross Changes at High Bath Temperature

A look at the illustration will show that the temperature curve has two main features, namely, that it is almost horizontal to 900 degrees F., and almost vertical above 900 degrees F. It would be expected that this radical change would be reflected some way in the character of the dross, and it is. The dross as seen under the microscope above 900 degrees F. shows a different kind of zinc-iron alloy crystal. The characteristic needle - like rhombohedron crystal below 900 degrees F. has been replaced by a hexagonal pyramid of the first order in the hexagonal system of crystallization. The cross section therefore of a crystal would be a hexagon, or a six-sided figure. These can easily be recognized in the dross micrographs above 900 degrees F.

Thus, without even seeing the galvanizing bath, the temperature can be roughly shown by simply examining the dross crystal form. If the bath is under 900 degrees F. the long slender crystals will be found; if over 900 degrees F. the hexagon crystals will be found. Since 900 degrees F. is the danger limit of temperature, because of pot destruction, dross production, and overheating the zinc in the bath, this check of crystal form, together with the iron content of the dross will show that the temperature is down in the dross area.

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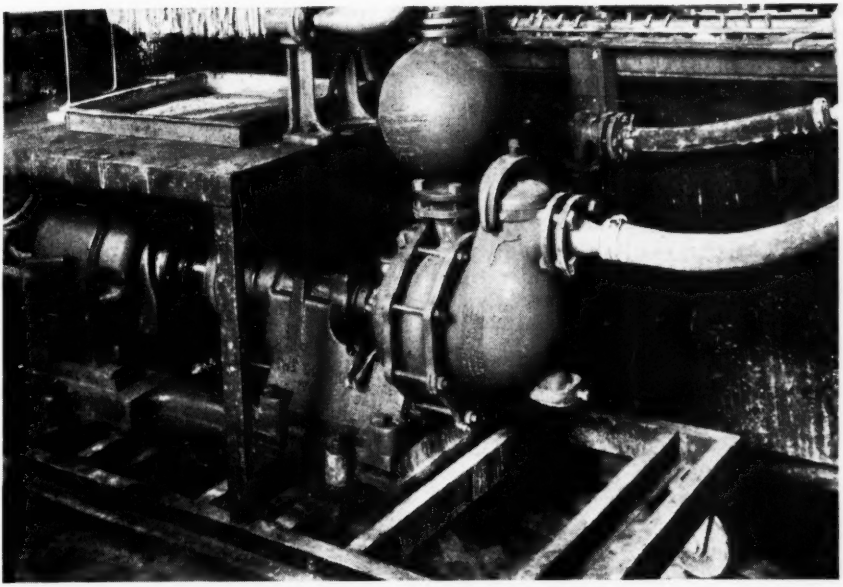

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Iron Content of the Dross Indicates Bath Temperature

The approximate bath temperature is indicated by the iron content of the dross. Thus, if the dross be sent to a chemist and the iron content is found to be over 4.00 per cent then it can be assumed roughly that the bath temperature is over 900 degrees F. If the dross is an average dross, and shows an iron content of about 3.75 per cent then it may be assumed that the bath temperature is under 900 degrees F. It is to be expected that in practice there will be a variation, and not a definite iron content for each bath temperature. This is because another factor has an influence on the dross. It is the iron present in the bath. The bath will hold more iron in saturation at higher temperatures, and the zinc-iron alloy crystals are higher in iron content at higher bath temperatures. As the temperature rises, more iron is held both in the bath and in the crystals. At the higher bath temperatures, the crystal readjustment and change of crystal form are accompanied by the higher iron content.

Summary of Relation of Iron Content of Dross to Bath Temperature

To be most useful, a summary of the information about the relation of the iron content of the dross to the bath temperature should be divided into a summary of practical information, and theoretical information. In this form, a clear picture of the whole situation can be seen, and much benefit can be derived by the practical application of the knowledge to actual operating conditions.

A. Summary of Practical Information

1. The time element is a vital factor in releasing good metal from the dross. The old hand operation of cutting and slicing the dross should be done away with in favor of the quicker, and more efficient method of vibrating the dross to release this good metal.

2. Dross should not be sweated at high temperatures to recover the zinc in it. The zinc recovered is very high in iron content and produces more dross in large quantities when this decanted metal is put back into the pot.

3. The iron content of the dross increases with increase in bath temperature. The correct iron content of the dross is about 3.75 per cent iron, which dross is formed at a galvanizing bath temperature of about 860 to 875 degrees F.

4. The dross increases in specific gravity with rise in temperature. Drosses made at higher temperatures are heavier than those made at low bath temperatures.

5. A practical check on the heat in the bottom of the pot can be made by having the dross analyzed for iron content. If the iron content of the dross is under 4.00 per cent the temperature is under 900 degrees F.; if over 4.00 per cent, the temperature is above 900 degrees F. A check analysis should be made by a different chemist for the iron content of the dross, and the actual temperature down in the dross should be found with a pyrometer. Temperatures above 900 degrees F. quickly burn out the pot, and produce very large amounts of dross, besides rendering the good metal into a condition unfit for coating purposes.

6. A galvanizing bath should always be drossed at the same temperature at which the bath is normally operated. This is done to retain the equilibrium between the metal and the dross, at the operating temperature.

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7. Since the temperature is the most important single factor in galvanizing, a good electric recording pyrometer should be used to control the bath temperature. The actual bath temperature should be recorded day and night, and never should be allowed to go over 900 degrees F. for any reason whatsoever. It is needless to state also that the instrument should be checked from time to time to be sure it is reading accurately.

B. Summary of Theoretical Information

1. The crystal form of dross made under 900 degrees F. is a rhombohedron in the hexagonal system; the crystal form of the zinc-iron alloy above 900 degrees F. is a pyramid of the first order in the hexagonal system of crystallization.

2. The change in the form of the zinc-iron alloy crystal from the long, slender, needle-like form of the rhombohedron to the form of the pyramid of the first order takes place at about 900 degrees F.

3. The iron content of the zinc-iron alloy crystals of the form of pyramids of the first order is higher than the iron content of the zinc-iron alloy crystals of the rhombehedral form found at the lower galvanizing bath temperatures.

4. The specific gravity of the dross increases with increase in temperature. Galvanizing baths should not be heated on the bottom because the heat currents upward will make the dross float. The metal zinc has a specific gravity of 7.19; dross lighter than this will float and get on the work; dross heavier than 7.19 will sink to the bottom of the bath.

5. An increase in bath temperature increases the amount of iron that will go into solution in the bath, and also increases the amount of iron in the zinc-iron alloy crystals. The crystals lose zinc up to 900 degrees F.; at this temperature a readjustment takes place, and the zinc-iron alloy crystals change form.

6. The crystal form of the zinc-iron alloy under 900 degrees F. is a long slender needle; over 900 degrees F. it is a hexagon, or six-sided figure. These crystal forms may be plainly seen in the illustration.

"For That Tough Pumping Job" is the title of a four-page bulletin now being issued by T. Shriver & Co., 810 Hamilton St., Harrison, N. J., illustrating and describing the Shiver Diaphragm Pump for use with corrosive, abrasive, viscous, thick-heavy, and so on, materials. Complete specifications together with several illustrations showing various installations of the pump are included.

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Hycar Synthetic Rubber. Filled with data never before revealed, an attractive 20-page compounding manual for Hycar O. R., an oil resistant type of synthetic rubber, is now being issued by the Hydrocarbon Chemical and Rubber Company, Akron, Ohio. The company was jointly formed last year for the manufacture and sale of synthetic rubbers by the B. F. Goodrich Company and the Phillips Petroleum Company.

Subjects discussed in relation to the oil resistant type of synthetic rubber are accelerators, adhesion to metals, antioxidants, blending with other materials, calendering, cements, examples of compound types, fillers, fabrication, heat resistance, lamination, mastication, mixing, molding, pigments, plasticizers, processing, softeners, solvents, specific gravity, tubing, vulcanization, and waxes.

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Modern Gold Plating

By JOSEPH B. KUSHNER, CH.E.
Metal Finishing Consultant
New York City

AUTOMATIC plating installations are always indicated whenever there is a mass production problem in plating. If the objects to be plated are similar or fairly uniform and are to receive the same finish, automatic plating is the only logical answer for the finishing executive who desires low production costs. Problems of this nature that arise in nickel, copper, cadmium, zinc, chromium or even silver plating are fairly easily solved by mechanized equipment and present no particular difficulties. The work is racked and enters the automatic tank system at the loading station from whence it goes through a series of cleaning, pickling, rinsing and plating operations which may involve a single metal to be plated or a sequence of three, like copper, bright nickel and chromium, without a human hand touching it from that point on.

The application of mechanized plating to gold is, however, quite limited at the present time. Automatic tank gold plating can only be used successfully where the finish or color is to be of one kind. Unfortunately, this is not the usual thing in gold plating. In the costume jewelry industry, for example, which is indubitably the largest mass producer of gold plated

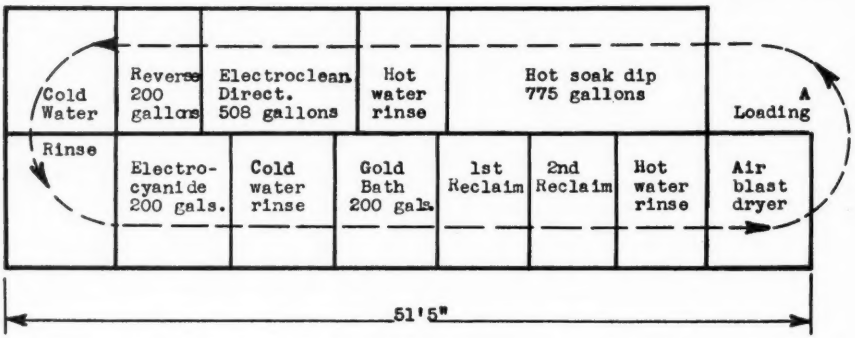

Fig. 35—Flow sheet of the automatic gold plating installation at the American Safety Razor Corp.

Automatic Gold Plating and Some Further Aspects of Dragout Losses

Part 9

objects in the country, the number of gold finishes as regards color alone, is practically infinite. How can all this be mechanized? Not only does the large number of finishes desired militate against full automatic plating in the costume jewelry industry; the variety in the size and shape of the work is an added factor against it as well, because of the difficulty in obtaining uniform racking and deposition.

The nearest approach to full mechanization in the industry is a semi-automatic plating installation set up not so long ago in the plant of one of the largest novelty jewelry houses. Here, the largest part of the work to be plated is cleaned, rinsed and bright nickel plated in a full automatic machine. The nickel plated work is then removed to small manual plating tanks where it is finished in various shades of gold, rhodium and silver. This is a step in the right direction.

It is not beyond the bound of possibility that someone may work out a full automatic installation that will be completely satisfactory for the mass producers of the costume jewelry industry. We can envision an arrangement whereby the work is racked on cleverly designed universal racks, goes into the plating system, then after getting cleaned and bright nickel plated, arrives at a switching station, where an operator at a panel switchboard shunts the various loads into yellow, white, green or pink gold plating tanks according to a written production schedule. After obtaining one of these finishes, the work, traveling on its conveyor, is shunted back onto the main line where it joins the procession of racks entering the drying machine. The work, not touched by human hands once it enters the plating system, comes out finished and ready for shipment or the stockroom. It may sound a little far fetched, but it is definitely within the realm of possibility.

Getting away from pipe dreams and down to brass tacks, there are places where mass production gold plating

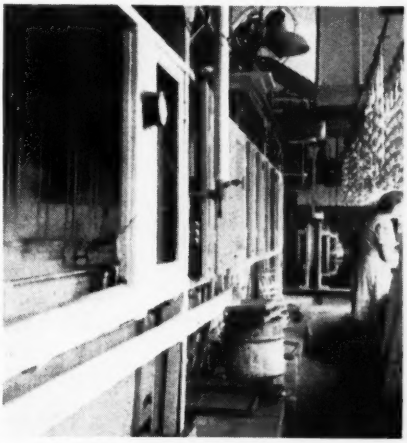

Fig. 36—A side view of the gold plating installation. In the background, part of the large generator required for the job can be seen.

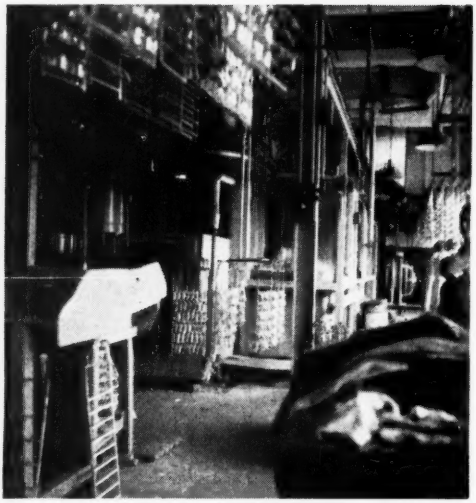

Fig. 37—A general view of the gold plating set up. Loaded racks are shown in position ready to begin the plating cycle.

is done, that can and do, make very satisfactory use of full automatic installations. In these applications only one color of gold is all that is desired and a full automatic is preeminently suitable. Such a case presents itself in the gold plating of safety razors. The parts are fairly simple, consisting of a stem and top piece, usually of brass stock, and all that is desired is a bright, yellow gold finish. Since as many as 100,000 razors may have to be plated during the course of a day, it is easy to see why an automatic plating installation is a prime necessity.

It is our intention to describe here the full automatic gold plating installation at the American Safety Razor Corp., one of the few plants in the country possessing such a set-up. The Gillette Safety Razor Co. also possesses an installation that is quite similar to this one, both having been built by the Hanson-Van Winkle-Munning Co. We were fortunate in being able to take a few photographs of the machine in operation, through the courtesy of the American Safety Razor Corp., and trust that they give some idea of the arrangement.

The flow sheet of the automatic gold plating installation at the American Safety Razor Corp. is shown in diagram Fig. 35. It is a return type automatic conveyor, transporting two racks on every hanger, with an overall length of 51 feet and 5 inches. Some idea of the length and size can be gained from the photographs. The conveyor has a chain speed of about 21 feet per minute and one complete cycle requires 13 minutes. The installation is completely housed in glass and is exhausted by a blower which removes undesirable fumes and vapors.

Starting at point A in diagram Fig. 35, the work, racked 96 pieces to the rack, passes successively through the following steps:

1. Hot soak emulsion cleaner: 5 minutes.
2. Water spray rinse (hot).
3. Direct current electrocleaner: 4 minutes.
4. Reversed current electrocleaner: 30 seconds.
5. Water spray rinse (cold).
6. Warm electrocyanide dip (5 to 8 per cent solution): 30 seconds.
7. Cold running water rinse.
8. Gold plating bath: 30 seconds. The volume of the bath is 200 gallons and the concentration of gold in it is 10 pennyweights (.5 troy oz.) per gallon.
9. First reclaim rinse tank.

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10. Second reclaim rinse tank.
11. Hot water rinse.
12. Hot and cold air blast dryer.

We might point out here that the cycle at the Gillette Razor Co. is very closely similar to this except that three reclaim rinse tanks are used,

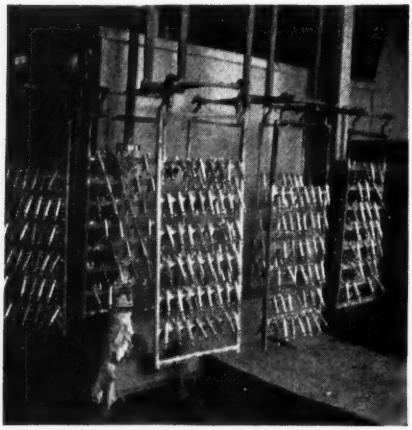

Fig. 38—The small workpieces are placed on specially designed racks which are hung on the conveyor of the automatic plating unit.

and the cycle is somewhat longer, taking 35 minutes to complete.

Each razor is plated with a definite amount of gold, controlled by time and current density. The current density is governed by means of a special switchboard and the temperature of the bath is thermostatically regulated. At regular intervals the plant chemist checks the amount of gold deposited on the razors by stripping the gold from sample razors and analyzing for gold content. The plant chemist also carefully maintains the gold concentration of the bath by daily additions of potassium gold cyanide to make up for metal depleted by plating on the work and exposed contacts of the insulated racks and metal lost by dragout. Once a month, the reclaim rinses are emptied and the gold is recovered. When the installation is running at full capacity it is capable of turning out approximately 80,000 razors every 16-hour day, though at present very little gold finishing is being done.

The point that will probably impress the gold plater and finishing executive most is the high concentration of gold in the plating tank. One-half troy oz. of gold per gallon seems excessively high. A concentration of gold this great is practically unheard of in costume jewelry plating, yet, this concentration of metal is probably the lowest that can be used in the 200-gallon tank that will produce good, uniform results.

Why this should be so is not hard to see. As we have pointed out previously in another article, high gold content is a desirable feature in production gold plating, from the standpoint of turning out uniformly colored work, just as large size tanks are desirable for the same reason. The situation is somewhat analogous to reception with various types of radio receivers. When you turn up the volume on a small set, the speaker rattles as the maximum power of the tubes is put through it and distortion results. When you turn up the volume on a larger radio containing more tubes, to a similar point, the speaker does not rattle or blast and you get clear, smooth reception. Even if you have the volume down low (draw less current) you get better reception on the radio with more tubes because you have a reservoir of power that prevents fluctuations in current.

The same principle holds true in gold plating. Depending on the amount of gold that is being taken out of the plating bath during the course of a working day, there is a certain maximum permissible working range of gold concentration va-

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riation, which, if exceeded, leads to poor, non-uniform results. If, for example, the concentration of gold in the plating tank is permitted to drop as much as 50 per cent before re-

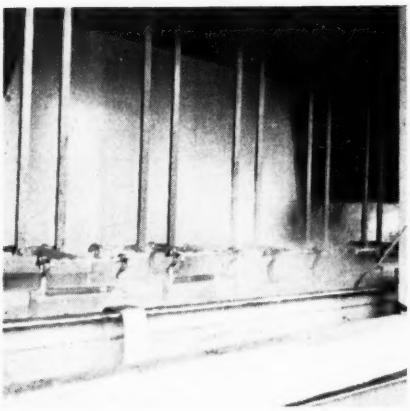

Fig. 39—A close-up view of the racked work passing through a cleaning tank.

plenishing, one cannot hope to get results at the end of the plating period uniform with results at the beginning.

There is a conception in the minds of many gold platers and gold plating executives that the more concentrated a gold solution is, the more gold will be plated out on the work when all other conditions are equal. This is not altogether true. The amount of gold plated out depends purely on the current density, the time and the cathode efficiency. If you use the same current density and the same time of plating you will put on just about the same amount of gold because the cathode efficiency of a gold plating solution is approximately the same over a wide range of gold concentration. And, if by chance you are working with a gold concentration that has a low cathode efficiency and change to a higher gold concentration, with higher cathode efficiency, you can still plate out the same amount of gold by plating the work for a shorter period of time.

The only place where gold can be lost in large quantities is in the dragout. This was pointed out in last month's paper. But it was also demonstrated that gold removed from the plating tank by dragout can be recovered almost in its entirety if proper precautions are taken. Of course, there is the initial expense of purchasing extra gold to be considered, but it must be remembered that this extra gold remains in the tank, and since it is gold, it is just like having money in the bank except that you get no interest on it. So the only point that has to be thought of in building up your gold concentration is the loss in interest on the extra gold used as the "reservoir of power." In most cases, the added stability given the gold plating bath by the use of a higher concentration of gold more than overcomes the disadvantage of extra interest cost.

The effect of gold concentration on the stability of the plating bath as measured by concentration fluctuation is easily determined. In the case of the razors which we can use as a hypothetical example, let us say 80,000 are being plated daily. Let us assume that .0005 oz. of gold is plated on each razor (about 1¾ cents worth). Then a day's run will consume .0005 x 80,000 = 40 oz. of gold. It is safe to estimate that the minimum possible loss by dragout will be about 1 drop of fluid per razor which amounts to about ½ oz. of gold for the daily run, so at the end of the run (stainless steel anodes being used and no replenishments made) the concentration will drop from .5 oz. per gallon to $\frac{(200 \times .5 - 40.5)}{200} = .34$

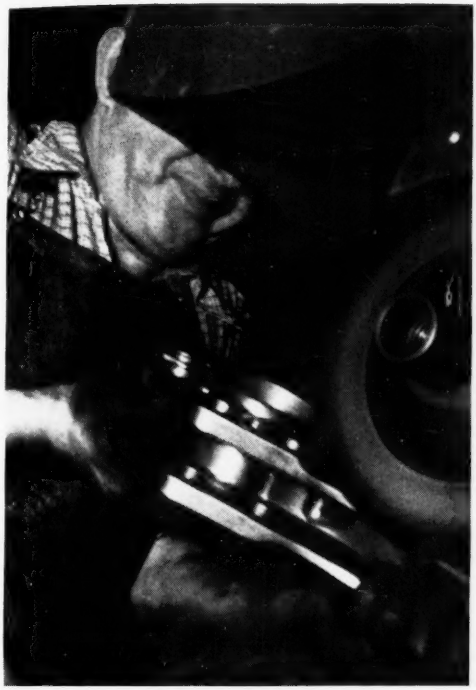

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Fig. 40—The operator shown in this illustration inspects the work as it passes through the gold plating solution tank.

oz. per gallon, a percentage fluctuation of 32 per cent. If the concentration to start with were .4 oz. per gallon, then the final concentration would be .20 oz. per gallon and the fluctuation 50 per cent, a fluctuation which is near the limit of safety as far as maintaining uniform results is concerned. On the other hand, if the starting concentration were 1 oz. of gold per gallon, then at the end of the day the concentration would drop to only .80 oz. per gallon and the fluctuation would be only 20 per cent, a marked improvement. A plot of this function, like the curve given in part 3 of this series for the variation of plating bath volume with concentration fluctuation is hyperbolic in shape.

We are merely trying to point out that a variation in the concentration of the gold solution of 50 per cent before replenishing should be considered maximum. As a matter of fact, a drop of 20 per cent or less before replenishing is even more desirable.

Let us suppose you are contemplating a gold plating installation in which you expect to plate on the average of 1,000 pieces daily. Each piece is to get about 3½ cents worth of gold (.001 troy oz.) and a preliminary test shows that the dragout per piece is about .00003 gallon. You do not want the fluctuation in the gold concentration to exceed 20 per cent before you replenish. What size tank and (or) what concentration of gold shall you use? If C is the desirable gold concentration and V is the desirable volume of solution you can set the whole thing up as an equation,

$$(1)\quad \frac{C - \frac{VC - 1 - .03C}{V}}{C} = .20$$

VC is the amount of gold in the tank, 1 is the ounce of gold that you are going to remove daily by plating and .03C is the amount of metal that is going to be lost by dragout. Multiplying out and solving for C we get:

$$(2)\quad C = \frac{1}{.2V - .03}$$

In most cases the minimum volume of solution that can be used is predetermined by the size and shape of the work to be held in the tank at a given time. Assuming that 5 gallons is the minimum possible size, then

$$C = \frac{1}{1 - .03} = 1.03 \text{ oz. of metal per}$$

gallon. It is better that we use a larger tank and a smaller concentration of gold, in a case like this, since

we can reduce our dragout loss by so doing. Let us assume that we find we can get a good color at a concentration of gold of .25 oz. per gallon, then the volume of the tank we need would be:

$$V = \frac{1 + .03C}{.2C} = \frac{1 + .03 \times .20}{.20 \times .20} = 26.4$$

gallons. This is the logical tank volume to use. And in using this tank volume and gold concentration we know that under maximum production our gold concentration will not drop more than 20 per cent during the course of the day. This example gives a rudimentary idea of the thought that should go into planning a gold plating installation where uniformity of results is desired. The subject is considerably more involved and will be discussed in greater detail in a future article on the planning and control of a scientific gold plating installation. For the moment, we are going to skip to the second point of interest to be noted in automatic gold plating installations: the use of two or more reclaim rinse tanks in series.

Are two reclaim rinse tanks in series, both of the same volume, superior to one reclaim rinse tank of twice the volume of either one? This is an interesting and important question as far as production gold plating is concerned. Oldam, for example, in an article on "Metallic Losses in Gold Plating"[1] states ". . . one reclaim tank is insufficient . . . two or more are necessary." Matter of fact, we said the same thing several years ago[2], and we still believe it today, but there are cases where the superiority of two over one is so slight as not to

[1] *P. A. Oldam—The Monthly Review—Sept. 1940.*
[2] *J. B. Kushner—Metal Industry—Jan. 1935.*

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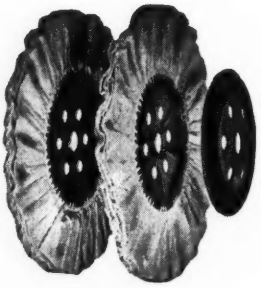

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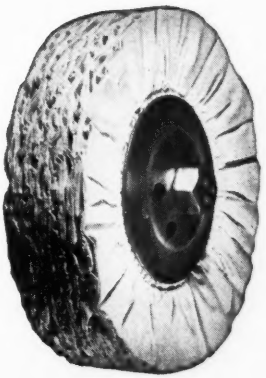

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warrant the extra expense of a second tank and the extra up and down motion and rinsing required. A little

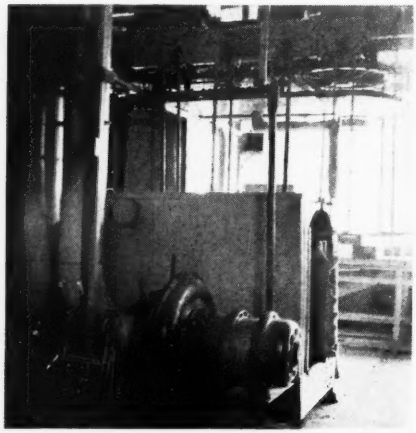

Fig. 41—An air blast drier located at the end of the plating sequence removes all traces of rinse water from the workpieces.

mathematical analysis soon proves this to be so. As we pointed out last month, the mathematical going is somewhat difficult, so if you don't care for this kind of stuff, skip it and examine the results at the end.

Gold Recovery from One and Two Reclaim Tanks

Since in an automatic installation a large number of pieces are plated daily, it is a safe mathematical assumption to treat the dragout process as a continuous one, that is, we can assume the gold plating bath is flowing in a tiny but steady stream through a pipe into the first reclaim tank from whence the mixture flows into the second reclaim tank and from there, down the drain. The diagram, Figure 42, makes this clear. That this is a correct assumption, even for ordinary production gold plating for which this analysis is intended to hold, can be proved quite easily and will be, in what follows.

Proceeding under the assumption of a continuous process, we can use differential equations to simplify the analysis. Let the concentration of gold in the plating tank be maintained at C oz. per gal., the average dragout volume per piece plated, v gallons and the volume of water in the first reclaim rinse tank W gallons (these are the same symbols used in last month's work). If the concentration of gold in the first reclaim is C_1 after n pieces have been rinsed in it, we can state that

$$(3) \qquad W \frac{dC_1}{dn} = v\,(C - C_1)$$

This is a differential equation which states that the change in the rate of increase of gold concentration in the first reclaim is equal at a given moment to the amount of gold we are putting into it minus the amount of gold we are taking out.

And in the second reclaim which has the same volume as the first, if C_2 is the concentration of gold in it after these n pieces have passed through it,

$$(4) \qquad W \frac{dC_2}{dn} = v\,(C_1 - C_2)$$

The first differential equation is a simple one which can be directly integrated to give the result:

$$(5) \quad C_1 = C\,(1 - e^{-vn/w})$$

where e is the base of natural logarithms, 2.718.

At this point it is convenient to demonstrate that the assumption of a continuous process is a correct one. If we remember last month's analysis or consult it again, we will recall that the exact equation worked out in a step by step analysis of the individual, discrete, dipping or rinsing in the reclaim, of each rack or workpiece

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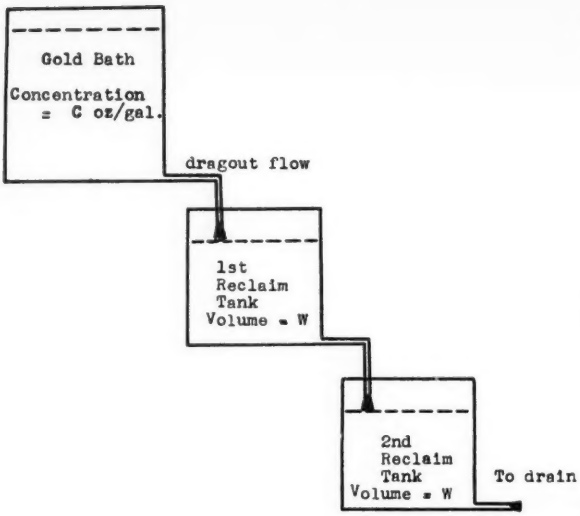

Fig. 42 — Diagram showing drag out cycle in continuous or automatic production gold plating.

we obtained the result:

$$(6)\quad R = WC\left[1 - \frac{1}{(1+\frac{v}{W})^n}\right]$$

Where R is the total amount of gold recovered (C_1W) after n pieces of work pass through the reclaim.

If we multiply equation 5 by W on both sides we can see at once that equations 5 and 6 are exactly alike except for the expressions at the extreme right in each equation. If we can show that these two are almost or practically equal to each other, we will have proved our case.

The expression $\frac{1}{\left(\frac{1+v}{W}\right)^n}$ can be expanded by the binomial theorem as:

$$\frac{1}{\left(\frac{+v}{w}\right)^n} = 1 - \frac{vn}{w} + \frac{n\,(n-1)}{2!}\,\frac{v^e}{W^2}$$

•

The expression $e^{-vn/w}$ can be expanded by a Maclaurin series as:

$$e^{-vn/w} = 1 - \frac{vn}{w} + \frac{n^2}{2!}\,\frac{v^2}{W^2} \ldots .$$

The first two terms of each expansion are exactly alike and the next two terms differ by only a very small amount provided n is a large number, as it surely is in production gold plating. Thus the only difference between them is the difference between n^2 and $n(n-1)$. If n is a hundred daily, a comparatively very small daily production, n^2 is $100 \times 100 = 10{,}000$ and $n(n-1)$ is $100 \times 99 = 9{,}900$ and the percentage difference between these two is just about 1 per cent. If n is a thousand daily which is still very small for production work, n^2 is 1,000,000 and $n(n-1)$ is 999,000 and the percentage difference between them is now about .1 per cent which as far as you and I are concerned is practically nothing. As a matter of fact, as n gets larger the difference between these two terms becomes nothing at all. This being the case, we know that our differential treatment of the dragout process is completely justified.

The differential equation for the second reclaim rinse tank is somewhat more difficult to solve inasmuch as C_1 is a variable as well as C_2 but

by a little mathematical calculation we solve it and get as a final result:

$$(7)\quad C_2 = C\left[1 - e^{-nv/w}\left(1 + \frac{nv}{w}\right)\right]$$

Now the total amount of gold held by both rinse tanks will be since W is the volume of water in each, $WC_1 + WC_2$.

If we multiply equations 6 and 7 by W and add them we get that

(8) The total amount of gold held =

$$WC\left[2 - e^{\frac{-vn/w}{(2+vn)}{w}}\right]$$

If we had used a single reclaim rinse of twice the volume of either one, that is, of volume 2W we would have saved in the same interval

$$(9)\quad 2WC\left[1 - e^{-vn/2w}\right]$$

Which combination is holding more gold? If we attempt to answer this on a purely theoretical basis it would involve us in a fairly hopeless mess. Thus it can be shown that 8 always exceeds 9. The best procedure is to actually substitute figures into equations 8 and 9 and see what we get.

First let us take the automatic plating installation just described. The reclaim rinse tanks are emptied once a month when operating under full production. This means that 25x 80,000 = 2,000,000 pieces are rinsed, figuring 25 days in the working month. If the volume of dragout per piece is .00001 gal. (a little less than a drop per piece) and the gold con-

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centration is .5 oz./gal. and the volume of each reclaim is 200 gallons then the system holds:

$$200x5\left[2-e^{\frac{-.1}{(2+1)}}\right] \text{ oz. of gold}$$

$$\frac{vn}{W} = \frac{.00001 \times 2{,}000{,}000}{200} = .1$$

and $e^{-.1}$ is equal to .905 according to a table of natural logarithms, so doing the indicated operations we get as a final result that the amount of gold saved is equal to 9.95 ounces.

If we had used a single reclaim rinse tank of 400 gallons, how much would we have saved?

Substituting in equation 9, we get

Gold held equals $400x.5\quad 1-e^{-.05}$

where .05 is equal to $vn/^2W$. $e^{-.05}$ is equal to .951 according to the table of natural logs. So substituting and carrying out the operations, we get that the total amount of gold saved is 9.8 ounces.

In other words, the two reclaim tank system has saved only .15 oz. of gold more than a single tank would have over the period of a month. Chances are, the extra up and down motion costs more than the $5.25 saved per month.

On the other hand, if the dragout volume were .0001 gallons per piece because of the nature and type of the object being plated, a substantial saving would result, as we can see by substituting into equations 8 and 9 again. In this case vn/W is equal to

$$\frac{.0001 \times 2{,}000{,}000}{200} = 1$$

and with 2 tanks

$$\text{gold saved} = 200x.5\left[2-e^{\frac{-1}{(2+1)}}\right]$$

which is equal to 89.6 oz. per month.

With one tank twice the size

$$\text{gold saved} = 400x.5\left[1-e^{-.5}\right]$$

which is equal to 78.6 ounces of gold.

Thus the net saving is 89.6 — 78.6 or 11 ounces of gold which is worth consideration.

The figures that have just been given merely go to prove that the blanket statement "two rinse tanks in series will always save you more money than a single rinse tank twice the size" does not necessarily always hold true because as was shown by the first numerical example sometimes, the extra motion required, particularly where manual labor is used, may cost more than the gold saved in the second tank. Circumstances alter cases, and only by an individual analysis of your own particular case can you determine whether it pays to use two or more rinse reclaims instead of one. The answer to your particular problem can always be found in the simple fraction vn/W. If in your particular case this fraction is less than a certain limiting value, you can best use only one rinse tank, if it is equal to this limiting value, or greater than it, it is imperative that you use at least two reclaims. Just what this limiting value is, we shall have to discuss in another paper.

We gratefully acknowledge information given us by the American Safety Razor Corp. and the Gillette Safety Razor Co.

Ferro Controlled Consistency Clays. A new brochure issued by Ferro Enamel Corporation, 4150 E. 56th St., Cleveland. Ohio, announces a new and exclusive feature of Ferro clay, used in processing porcelain enameled metal products. This is "Controlled Consistency," which means that the "set" or "consistency" characteristics of Ferro clay are now laboratory-controlled and kept within very narrow limits.

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Aluminum Ladders. A 44-page catalog, describing many types of aluminum ladders, is now being issued by the Aluminum Ladder Company, 138 Adams St., Tarentum, Pa. In addition to the usual broad selection of ladders for fire fighting, industrial and commercial use, this catalog includes data on aluminum gangways, stages, scaffolding, conveyors, and many special aluminum ladders.

Some of the special ladders outlined are a portable entrance ladder which weighs only one-half pound per foot of length, a channel ladder which is hinged in the middle, for easy storage, and a telescoping ladder made up of short lengths which can be easily connected to form one complete unit up to 26 ft. long.

The catalog also contains interesting general information relative to the strength, durability, and utility of aluminum ladders and gangways. A free copy will be mailed to anyone requesting it on his business stationery.

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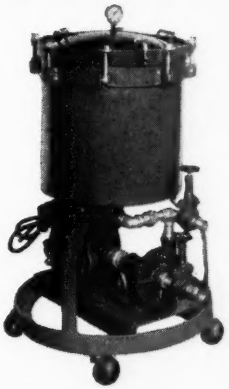

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Barrel Finishing of

The Value of Barrel Finishing Procedure in the Conservation of Metal Anodes.

By H. LEROY BEAVER

Barrel Finishing Consultant
Lansdale, Pennsylvania

FROM personal attendance at meetings of various societies and groups primarily interested in the finishing of metal products, one cannot help but sense a growing tendency of alarm at inability to obtain immediately supplies of anodes of the various metals now commonly electrodeposited, and this is especially true of anodes of nickel and cadmium.

In all of these discussions, the concern has invariably been "Where can we get the anodes?" but we have yet to hear of any concerted or individual thought respecting the conservation of the anodes we already have, and further, any discussion of ways and means to make further anode supplies reach as far as possible in the metal finishing process and still maintain a satisfactory corrosion resistant coating on the base metal itself.

And so, in this paper we would like to briefly discuss the place in metal finishing procedure that is or should be occupied by various barrel finishing procedures leading directly to conservation of metallic anodes of every sort.

To the initiated, it is generally and most positively known that the process of barrel burnishing when properly carried out, does not remove any part of the surface coating whatever the metal may be. Disregarding its superficial aspects and dwelling especially on the cold working of the surface for hardness and for resistance to wear and, in this operation, the least partial flowing of the surface to close pores for resistance to corrosion, we have a method of procedure that in itself provides for the conservation of deposited anode metal.

Now as we have so often stated, barrel finishing procedure is never to be contemplated as a panacea for all metal finishing deficiencies, nor has it been developed to the point where every kind and character, shape or size of metal product can be barrel finished in the sense where we would consider the barreling operation as a commercially practicable one, but our present comment relates only to such parts as are known to be susceptible to finishing by barrel procedure.

When we speak of a barrel finishing process as definitely removing no part of the metal coating whatever, this statement, of course, is predi-

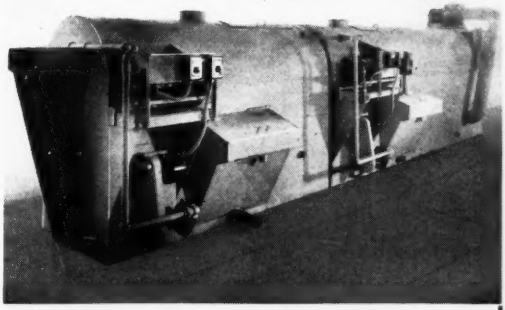
ing of Metal Products

cated on the steel burnishing material being in satisfactory operating condition, free from rust pits, almost invariably caused by neglect in the handling of the steel burnishing materials, and also free from hard coatings of insoluble lime soap formations, for either or both of these conditions will result in surface removal to at least some degree.

Now for general consideration and as covering an entire range of electrodeposited coatings, let us take a figure such as .002 in. as representing the average thickness of plate deposited on a base metal part, or if you choose you may select a figure represented as .0002 in. for the thickness of deposited plate. We assume that it has been found necessary to deposit this thickness to obtain any satisfactory corrosion resistance values on appropriate tests. Following the deposition of the plate, we have two recognized forms of procedure for obtaining the final market finish for the particular product—one being polishing, buffing or coloring as the case may be, and the other some form of barrel finishing procedure. Either

CLEANS 25,000 LIGHTWEIGHT PARTS PER HOUR

A difficult problem of "Wash, Rinse and Dry" has been solved by this RANSOHOFF Machine for a manufacturer of small battery shells. These parts are both difficult to clean and dry because of their light weight and tendency to hold water. But the work is performed by this continuous, drum type machine without scratching or deformation and at an exceptionally low cost. The machine fits directly into the production line. There is practically no labor cost, as one man operates five machines each in its own production line.



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N. RANSOHOFF, INC.

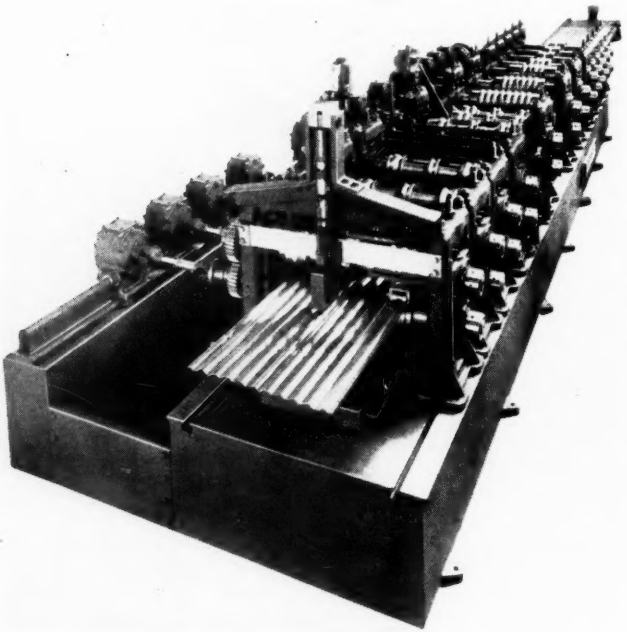
212 W. 7lst St. Cincinnati, Ohio

of the two operations must be used in some sense, for either taken alone would not be applicable to every form or size of metal part. But in this we wish to make two quotations each respecting one of these forms of finishing. The first is from Research Paper RP1293 of the Bureau of Standards, and on the sub-heading of "Buffing," we quote as follows:

"All of the plain nickel coatings and about half of the bright nickel coatings were 'colored' on 'loose buff' cloth wheels with commercial buffing compounds. A few of the copper coatings (indicated in the table) were also buffed. The direct chromium coatings were 'colored' on a sewed buff and were finished on a loose buff. The loss in weight by buffing (usually 5 to 10 per cent of the coating) was determined in trial runs, and was taken into account, so that the buffed deposits had the specified thicknesses (within plus and minus 5 per cent)."

And our second quotation relating directly to barrel finishing procedure is taken from the record of the United States Circuit Court of Appeals for the First Circuit, in Equity, 80, being the case of Copley-Plaza Operating Company vs. Schaum & Uhlinger, pages 36 and 37, from which we quote as follows:

"Under the old methods, particularly where buffing wheels and scratch brushes were employed, the plating of silverware was constantly worn down, and replating the hotel silverware occurred about every six years. In



THE illustration herewith shows a view of a specially designed 12-stand cold-roll forming machine now being used by Porcelain Steels, Inc., Cleveland. Ohio, for the production of Por-Ce-Lok, an interlocking corrugated sheet which is porcelain enameled on both sides. With a production speed of approximately 120 feet per minute on 20 to 26 U. S. Standard gage enameling iron, this machine produces Por-Ce-Lok roofing and siding ready for porcelain enameling.

Por-Ce-Lok is available in standard colors of Royal Blue, Forest Green, Maroon, and Fall Brown.

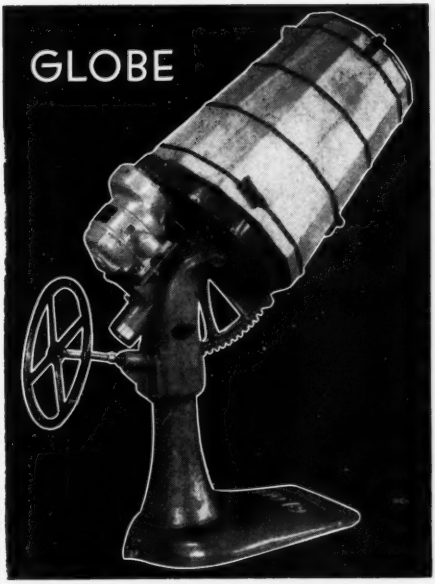
the patented method there is no appreciable wear, the rolling action of the steel balls across the surfaces of the silverware serving to roll down and harden the plate.

"It is interesting to note the testimony of Mr. Frazier, manager of the Bellevue-Stratford Hotel in Philadelphia, concerning an actual test that was made by that hotel to determine the wearing effect of the patented process on the silverware. A silver plated dish was weighed before placing it in the machine. It was then run in the machine for 30 days, after which it was weighed, 'and found that the loss of plate was almost infinitesimal.'

"This test was the equivalent of at least 50 years of service conditions. Another test was made by the Gorham Manufacturing Company, the well known silversmiths, wherein a number of silver utensils were operated on for 50 hours continuously, equivalent to approximately ten years of ordinary service conditions. The pieces were weighed before and after the operation. In all but one case the loss of weight was 1/5 pwt. or less, and in one case the loss was 2/5 pwt. As a result of this test, the method was recommended by the Gorham Manufacturing Company for use in hotels, restaurants and clubs.

"In addition to the great savings of wear and tear on the silverware and the prevention of loss of plate over the old methods, the patented method brought about a very large saving in labor."

These quotations are submitted in no sense as a comparison of value



BETTER FINISHING WITH NEW LOW SPEED!

This new Globe Tumbling Barrel achieves a new low speed ideal for finishing nonferrous metal parts. Tumbling at only 30 revolutions per minute it assures you of highly finished parts free of nicks and scratches. This new Globe Barrel is more compact. The motor is mounted directly above the gear segment instead of on a separate base.

A hundred different industries are daily being served by Globe Tumbling Barrels. Find out how they can serve your finishing department too. Globe invites your inquiry on any finishing problem. No obligation.

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THE GLOBE MACHINE & STAMPING CO.
1250 WEST 76TH STREET
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between two different methods of finishing metal products, and they are to be only considered in respect to their relative values in the importance of the conservation of what are said to be very limited supplies of metal in anode form.

Surely, most readers of this series would not have to strain their minds to recall many concerns who use at least 1,000 pounds of anodes per month and in the larger concerns this figure can be many times multiplied.

We may take the statement that even when parts were operated continuously for 30 days, the loss was almost "infinitesimal," then if we are interested at all in the conservation of our metal supply, this comparison must cause us to pause and take stock of just what can be done by way of adapting the metal conserving barrel finishing operation to as many parts as possible that would be considered susceptible to finishing by the barrel method.

We have many barrel manufacturers and while the variety and sizes of barrels available are somewhat restricted, whatever barrel you happen to have installed can be called into production to perform its parts in the conservation of the metal used in our plating procedure.

Certain it is that when we depend on cold working to harden the plated surface and close the pores as we do in a barreling operation, there is no reason why a final coloring operation cannot be used if it is desired, but this would be only a "feathering off" and would remove if anything, only a very negligible part of the surface.

So long as we are unable to eliminate pores in the surface coating which are responsible for the lack of corrosion resistance values of plated surfaces, by electrochemical means, then we must resort to some other method that will perform this function. If it requires a coating thickness of .002 in. to afford corrosion resistance where cold working methods are not employed, then we make bold to state that .001 in. thickness of metal deposited on the same parts and from the same solution, when properly barrel finished in an adequate barrel with an appropriate load of burnishing material to supply the weight for the cold working factor, will show greater corrosion resistance values than would the .002 in. of metal treated in any way other than by barrel finishing procedure.

And as in most research problems, one determination leads directly into another, we feel that we should point out that, where barrel finishing is applicable and where less material or should we say less anode metal is required to be deposited, there is a very distinct saving in time as well as an equivalent increase in production volume.

And as well, the major concern of the average plater is where he will be able to obtain adequate supplies of anodes, especially of nickel, zinc and cadmium. In this connection we would refer the reader back to our quotation respecting the barrel finishing of silver plated parts. Silver plate is particularly susceptible to finishing by the barrel method and indeed in the finest institutions in the country is used in the maintenance of silver plated wares. Silver works so easily in the cold working barrel process that it is very quickly made corrosion resistant and hardened to resist wear.

Perhaps we do not have inadequate supplies of the important nickel, zinc and cadmium, but there can be no question that we have a vast store of silver that in this emergency could be drawn upon for plating purposes. Due

to the fact that less plate is required to be deposited and that the barrel finishing cycle on silver plated parts is generally accomplished with an average load of 1,000 lbs. of steel burnishing materials in approximately 20 minutes, it can be very clearly seen that with less plating time on the deposition of the silver itself and with the almost minimum operating time cycle for properly barrel finishing the parts, not only for the superficial surface luster but for the closing of pores and hardening of the surface as well, silver should have most serious consideration.

It has been the policy of the author of this series to draw as few comparisons between one method and another as possible, preferring to simply state the condition and then let the reader draw his own conclusions, and certainly to make no criticisms unless they were in every sense to be considered as constructive in character, and offered only in a sense of a wish to be helpful.

For the benefit of the readers of this series we believe we should state that we are not an employee or on the payroll of any manufacturer of burnishing barrels, burnishing materials, buffs or compositions, because we are in every sense what might be best termed a "free lance," and we hold no brief for any manufacturer of any instrumentality or materials used in barrel finishing procedure. Our chief interest lies not so much in whose instrumentality or materials you use, as it lies in knowing whether you have the best equipment and materials for the particular operation you wish to perform.

In all of the tests previously made for corrosion resistance of plated surfaces, barrel finishing procedure has been studiously ignored and all of the

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METALPREP Metal cleaner and rust remover. Insures firm paint bond to metal.
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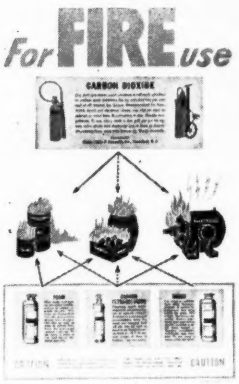
stress placed upon polishing or buffing. We feel that it is what we might well term "high time" that some consideration should be given to the place that barrel finishing fills in the scheme of plating procedure. We have repeatedly insisted that when corrosion exposure tests were made that there should be at least three specimens, as follows:

1. The part just as it comes from the plating bath with no finishing operations whatever.
2. The part plated and conventionally buffed and colored.
3. The part appropriately barrel finished.

And that tables of comparative corrosion resistance values should be set up in each case, but it seems to be more and more doubtful that such a procedure will ever be taken unless it is insisted upon by the contributors to these various research funds. Barrel manufacturers generally make much the same claims for the barrel finishing process, and we can be safely accused of making quite a large number of claims on our own part, none of which have ever been sucessfully contradicted by exponents of any contrary method, and in time of emergency when the stress is all on production and more production, barrel finishing has earned and deserves the right to be considered along with every other form of metal finishing.

Fire Fighting Poster. "What to Do in Case of Fire" is told on a new poster recently released by Walter Kidde & Company, Bloomfield, N. J. It gives brief, concise instructions on how extinguishers should be used on each type of fire. Avoiding technical language, the wall sign gives basic fire fighting facts on carbon dioxide, foam, carbon tetrachloride, and water type extinguishers. The poster tells when each should and should not be used. It describes necessary maintenance required by each unit.

An interesting feature of the poster is the complete absence of advertising. It is designed for use as an instruction sheet to be posted on bulletin boards as



Fire Fighting Poster

safety posters are used. Some plants have adopted the rule that this wall sign should be hung beside each fire extinguisher in the shops and offices.

Walter Kidde & Company is distributing these posters free, in any quantity, to business or manufacturing concerns which desire them. Simply address your request to the company at West Street, Bloomfield, N. J., and posters will be forwarded to you without charge.

"Plastics in Industry" is a book that will clarify many confused ideas regarding plastics and the plastics industry. This book is now being issued by Chemical Publishing Co., Inc., 236 King St., Brooklyn, New York.

Manufacturers must realize the following few facts illustrated by one particular type of plastic: An object, when made from metal, may have to be built up from several separate pieces, the very making of which can entail a waste of 20 to 50 per cent of metal. In the building it is crimped, soldered, screwed, or welded, sandblasted and degreased, chromium-plated or painted; varnished, buffed or polished before it can be sold to the customer. A simple

metal object may undergo a dozen processes of preparation.

The same object in plastics, polished and colored throughout, can be turned out one, two, or a dozen at a time in two minutes with virtually no waste of raw material, and only needing packing to be ready for the customer. Morever, plastics often allow of simpler designs.

A copy of this book may be obtained by sending $5.00 to the Chemical Publishing Co., Inc.

Westinghouse Radiant Heat Drying Lamps. How to apply radiant heat lamps to industrial drying, baking, and heating tasks is told in a new 12-page illustrated booklet now being issued by the Westinghouse Lamp Division, Bloomfield, N. J. The fundamentals of radiant heat are presented in the first section of this publication, followed by four pages of photographs showing typical drying lamp installations.

Application data, with formulas for calculating the number of kilowatts required to produce the necessary amount of heat, and recommended spacing of the lamps are included. All types and sizes of Westinghouse drying lamps are listed and described.

Copies of booklet A-3817 may be obtained from the advertising department of the Westinghouse Lamp Division, Bloomfield, New Jersey.

Butterfly Valves. A 12-page bulletin designated as 8-B and featuring late models of standard and wafer type butterfly or blast gate valves manufactured by R-S Products Corporation, Wayne Junction, Philadelphia, Pa., for the control of air, gas, steam, and liquids is now being issued by the company. This bulletin contains interesting data and illustrations for both manual and automatic control by means of air and electric motors, solenoids, air and hydraulic cylinders.

It is said that these valves seat tightly due to the 77½ deg. angle of closing and are suitable for high temperatures as well as sub-zero refrigerating conditions. Some of the features mentioned are quick action, self-cleaning, and light weight. Complete specifications and flow charts are also included.

A copy will be mailed free upon request to any firm or individual.

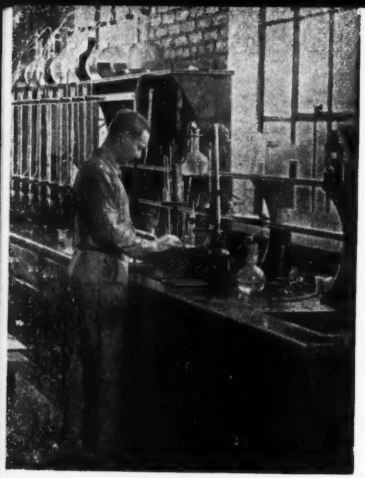
To Serve . . . and to Save
— a BIAS Buff Principle

Genuine BIAS Buffs are made to serve—and to serve well—as long as they last. They're made of best cotton cloth from our own mills. This cloth is bias cut and bias formed. BIAS Buffs are constructed by workers of long experience.

And so a BIAS Buff outlasts ordinary buffs—requiring half the number of sections—saves compound —saves time—saves operators' efforts. BIAS BUFFS save you money while serving. They are profit makers, not wasters. Try them.

There's a BIAS Buff made for every buffing job!

The BIAS BUFF and WHEEL CO., Inc. 430 Communipaw Ave. Jersey City, N. J.



Practical Applications of MODERN Equipment

Checking Rinses at the Twist of a Knob

By NATHAN SCHNOLL*

AIMED primarily at conserving technically-trained man power in the present national defense emergency, a new instrument, in the development of which the writer was concerned, permits of checking rinsing operations at the mere twist of a dial and in the hands of average industrial personnel. In production routines where a rinse is involved, the degree or thoroughness of which is vitally important, it now becomes feasible to take readings in such direct terms as percentage of carry-over present, without resorting to time-consuming titration or other chemical means. Thus technicians can be released for more important work.

This instrumentation centers about the solu-bridge, which in turn is based on the principle of electrical

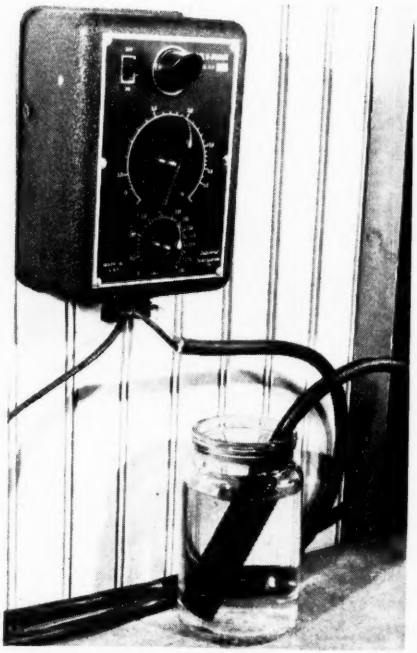


Fig. 1—The Solu-Bridge and its dip-cell, as used with samples of solution drawn from a tank for checkup.

* Chief Engineer, Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.

conductivity of industrial solutions or rinsing baths. The simple, compact, inexpensive instrument comprises a Wheatstone bridge for the accurate and stabilized measurement of resistance to the flow of electricity through given liquids. A "magic eye" similar to that used in tuning the modern broadcast receiver, serves as the indicator of circuit balance. The instrument panel carries two knobs. One is set for the approximate temperature of the rinse water or solution. The other or main dial knob is adjusted until the indicator reaches its largest dark segment, indicating circuit balance. The reading in the desired terms, such as parts per million of carry-over or contamination, is now taken directly off the main dial. An on-off power switch completes the controls of the instrument. Any industrial worker can operate the solu-bridge, without the slightest

Fig. 2—Using the Solu-Bridge in the plant. In this case a sample of washing solution is drawn in a jar and brought to the instrument. Note the dip cell immersed in the solution.

NEW RESULTS -- BY ADDING SOLVENTOL TO WATER -- IN SPRAY BOOTH OPERATION

1. COMPLETE PAINT SUSPENSION
2. PAINT SIMPLY AND EASILY REMOVED
3. DISPERSES CONTAMINATION IN EQUIPMENT
4. NO BUILD UP IN TANKS—PIPES—PUMPS
5. PAINT IN PERFECT CONDITION FOR RE-CLAIMING

No extra equipment required. Simply dissolve Solventol (new Synthetic-Organic Compound) in warm water and add to present tank. Total cost does not exceed ½c per gallon of water used. Write for sample and instructions.

SOLVENTOL

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chemical or technical skill.

Meanwhile, contact with a given cross-section and length rinse water or solution is established by a conductivity cell, connected with the solu-bridge. The liquid may be drawn

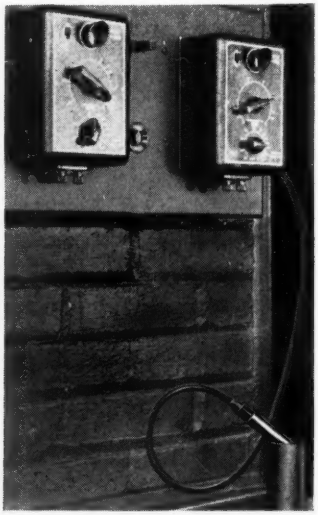

Fig. 3—A pair of Solu-Bridges conveniently mounted. Note the jar below, containing a sample of the washing solution, in which the dip cell is placed.

from tank or vat, in a suitable container, and brought to the solu-bridge for checkup. Or the instrument and its dip cell may be brought to any tank or vat. Again, in the permanent installation, several conductivity cells can be directly installed in as many tanks or vats, and, by means of a rotary switch, connected with a single solu-bridge. In this way, the attendant can check the rinse water or solution in any one of several tanks or vats, by setting the rotary switch accordingly.

Although a quite recent development, the solu-bridge has found widespread usage already, but mainly in the checking of industrial solution concentrations. The writer now suggests its use for the checking of rinsing operations.

In the treatment of metals, such as etching and pickling, the follow-up rinse must be thorough. The instrument provides accurate direct readings, since the reading obtained on the fresh water alone gives a definite reference point to which the rinse water will return after all electrolytic material has been rinsed out. Readings are therefore in terms of carry-over or contamination over and above the "plain water."

Many uses will suggest themselves for this simple instrument that checks the condition of rinse water or solutions.

A further refinement of the method is offered in the solu-bridge controller, which incorporates a relay for controlling an external alarm or signal, or again a corrective means. In this case the instrument not only checks or measures the rinse or solution, but provides a visual or aural alarm when certain limits are exceeded. By means of electromagnetic valves or other corrective means, the automatic correction for given conditions can be effected.

Shell and Tube Heat Exchangers. A four-page bulletin describing "Leverlox" Heat Exchangers is now being issued by Heat Transfer Products, Inc., 90 West St., New York, N. Y. The "Leverlox" Heat Exchangers are designed specifically for liquid to liquid exchangers with tube bundles removable for cleaning. Slight modifications permit the use of this construction on liquid to liquid exchangers with non-removable bundles and vapor to liquid exchangers of either type.

The butt bars, which are securely welded around the inner periphery of the shell, absorb the stresses incurred by the loads required to seal the unit against pressure and leakage. These

loads are always direct axial loadings. The bars also prevent the fluid in the shell from short-circuiting around the tube bundle. This is said to result in an increase in heat transfer efficiency. Baffles can be spaced so as to provide maximum heat transfer with a minimum of pressure drop.

The completely confined gaskets are of standard square material which is readily obtainable. The fluid flowing through the tubes is directed at each end by channels and heads of suitable material.

A copy of this bulletin will be sent free upon request.

Water Treatment for Evaporators, Distilled Water Stills, and Boilers. A new booklet, "The Water Treatment Science of Tomorrow in Today's Engineering," explains the theory of organic colloidal action and briefly discusses the modern trend in water treatment. This catalog may be obtained by writing to American K.A.T. Corporation, 122 E. 42nd St., New York City.

Westinghouse Generator Voltage Regulator Bulletin. A new 19-page bulletin describing the Silverstat voltage regulator for a.c. and d.c. generators has been announced by Westinghouse Electric and Manufacturing Company. The outstanding features and application for automatic voltage control of small and medium sized a.c. and d.c. machines are discussed with a special treatment of regulators for parallel operation of generators.

Operating details of each regulator type are given. Pictorial diagrams showing construction and wiring of representative regulators make the description easy to follow. Physical dimensions and drilling plans for projection or flush mounting are shown in diagrammatic form.

A data sheet form for the convenience of the purchaser lists all of the information required to make the proper selection of a regulator for a particular application.

Copies of descriptive data 31-260 may be obtained from department 7-N-20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Mention PRODUCTS FINISHING when writing to advertisers. Your cooperation will be appreciated both by the advertiser and this magazine.

NOW — THE NEW AND STILL BETTER! UNICHROME* "AIR-DRY" RACK COATING

A rack insulation that is phenomenally resistant to boiling cleaners and all plating solutions, and is AIR DRYING!

ALL YOU DO IS DIP RACK AND LET IT DRY!

Here is a new Unichrome* rack insulating coating that is miles ahead of any rack insulating you ever tried or heard of.

It is even better than the famous Unichrome* Rack Coating-W!

—Because this *new* Unichrome "Air Dry" Rack Coating has every one of Rack Coating-W's remarkable combination of advantages.

—And adheres in severe plating cycles still better than does Rack Coating-W.

—And cuts more easily at the contacts.

But has the immensely important *added* advantage of being AIR DRYING.

No hot dipping or force drying. All you do is simply dip your racks at room temperature and let them dry in the air after each coat.

Here's the story—seven big money-saving, trouble-saving, time-saving advantages:

(1) *Insoluble*—withstands hot cleaners and all plating solutions.
(2) *Harmless*—contains no ingredients harmful to plating solutions.
(3) *Tough*—withstands wear and tear of handling.
(4) *Flexible*—withstands repeated flexing and bending.
(5) *Durable*—reduces need for re-coating.
(6) *Easily Applied*—simply dip and let dry.
(7) *Convenient*—any part can be patched without re-coating rack.

Write for Bulletin No. 31
Containing Complete Information

Platers without rack-coating facilities may have their racks coated with "Unichrome"* "Air Dry" Rack Coating by Chromium Corporation of America, 4645 West Chicago Avenue, Chicago, Ill.; Belke Manufacturing Company, 947 North Cicero Avenue, Chicago, Ill.; or United Chromium, Inc., Waterbury, Conn.

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News OF THE INDUSTRY

Ault & Wiborg Launches Service League Program

The first annual Ault & Wiborg Service League dinner was held recently in Cincinnati at the Hotel Alms, with nearly 200 Ault & Wiborg employees from the middle western offices attending. Later, a second dinner was given at the Hotel Pennsylvania in New York for the eastern personnel.

The purpose of these dinners is to give recognition to employees with service records of five years or longer. Pins are awarded, depending on length of service, and ranging from a bronze emblem for five years to a gold pin studded with diamonds and rubies for the 40-year group. Since Ault & Wiborg was established in 1878, many of its representatives have long service records. A. C. Ransom, now head of the Ault & Wiborg Co. of Canada Limited, is the oldest employee in point of service, having been with the company for 51 years.

Toastmaster at the dinners was J. G. Morris, vice-president of A & W. Joseph R. Esposito, president of the organization, made the emblem awards and gave the featured speech of the evening. A reply for the employees was prepared by Mark W. Frishkorn, also a vice-president. The success of the initial dinners assures the continuance of these functions as an annual event, according to A & W officials.

Pennsalt Cleaner Division Holds Technical Sales Force Meeting

William P. Drake, manager of the Pennsalt Cleaner Division of the Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pa., called a meeting of his technical sales force at the Penn Athletic Club in Phil-

Scene of Ault & Wiborg Service League Meeting

adelphia, on Friday, March 28 and Saturday, March 29, for the purpose of considering new service and marketing problems presented by the national de-

William P. Drake

fense emergency. In attendance were the following technical men who aid the company's regular sales representatives in its district offices throughout the United States: Albert H. Clem, John S. Dimon, Joseph J. Duffy, Jr., William J. Hennessy, Joseph W. Manz, Willis J. Stoddard, William M. Swain, Clarence W. Burkhart, and Walter S. Riggs, manager of development of the Research and Development Department.

George B. Beitzel, manager of sales, gave a short talk on the importance of this group in relation to the company's sales and merchandising program. Richard L. Davies, manager of market research, explained to the group the part it is expected to play in the company's future activities in the metal cleaning and related markets. H. M. Ellsworth led a discussion on the service the technical sales force can render in connection with the advertising of Pennsalt Cleaners.

New Equipment for Service Departments

A new trend toward service department modernization evidenced by the larger and more progressive industrial organizations is forcibly demonstrated by The Hoover Company, North Canton, Ohio.

Time was when the service department of many sales branches was poorly housed, inadequately equipped and generally treated with indifference. The work was done the difficult way and its inferior quality reflected this poorly conceived policy.

But the modern way now prevails in the more progressive organizations. Up-to-date precision tools and methods are being used and the best of skilled workmanship employed for a job more thoroughly and more quickly turned out.

Typical of this new order is the policy adopted by the service department, an important unit of the Sales Division of The Hoover Company, North Canton, Ohio. Each year, this department of each of the many sales branches of this company reconditions thousands of Hoover cleaners, restoring them to a condition comparing favorably in performance and appearance with the newly built cleaners.

The Hoover Company has recently provided each of its factory branch service stations with the latest type equipment necessary to refinish all enameled parts and clean the motors of the cleaners.

This equipment, including spray gun and dusting gun, air compressor, spray booth and related parts, was procured from The DeVilbiss Company, Toledo, Ohio. It was found best suited to the work of improving the appearance of the users' cleaners brought in for service, was best adapted to restoration of the particular wrinkle finish of the cleaners and capable of a more thorough job of removing dust from the motors and castings.

Service department executives of The Hoover Company say the investment in this extensive installation is relatively small in the light of the return effected through the resulting customer satisfaction. The company has been enabled to not only do a reconditioning job more thorough and complete, but much more quickly as well, earning for its service organization a reputation which distinguishes it in the industry.

Study of Weathering Resistance of Porcelain Enamels Progressing

Two years ago the National Bureau of Standards and the Porcelain Enamel Institute, 612 N. Michigan Ave., Chicago, Ill., joined with 12 manufacturers of porcelain enameled products to conduct a study of the weathering resistance of

D. G. Moore, National Bureau of Standards, and C. S. Pearce, managing director of Porcelain Enamel Institute, check weathering resistance of porcelain enamel test panels.

porcelain enamels. This study was made necessary by the fact that, whereas some porcelain enamels were known to fail in 10 or 15 years, other porcelain enamels have lasted indefinitely. Accelerated tests such as used to break down other finishes had no effect on porcelain enamels.

St. Louis was selected as an ideal location for test panels due to the industrial type of atmosphere which is present. Panels for this test were erected on the roof of the Union Electric Company building about a year ago and the first annual inspection is being made.

The results of this inspection will be used by the engineers at the National Bureau of Standards to correlate with an accelerated test for weathering being developed at this time. W. N. Harrison, chief of the Enameled Metals Section of the National Bureau of Standards, is in charge of this work and indicates that results will be available to the industry shortly.

Shown in the photograph are D. G. Moore, of the Enameled Metals Section of the National Bureau of Standards, who is conducting the local inspection of these panels and C. S. Pearce, managing director of the Porcelain Enamel Institute of Chicago.

Comparative samples have been set up at Lakeland, Fla.; Atlantic City, N. J.; and Washington, D. C.

American Buff Company at New Address

The American Buff Company, formerly located at 228 N. Clinton St., has moved to its new location at 711 W. Lake St., Chicago, Ill. In its new and large plant, this company is now equipped to render excellent service to the industry.

Higbies Assume Active McAleer Management

At a recent meeting of the McAleer Mfg. Co., 2431 Scotten St., Detroit, Mich., manufacturer of automobile polishes, rubbing compounds, and allied chemical products, Carlton M. Higbie was elected president, and Bradley Higbie, treasurer of the company. Both

Carlton Higbie

have been inactively associated with the firm for some time, and are now assuming active management of the company.

The Hibgies bring to the management of the McAleer Company extensive experience with the manufacture and sale of automotive and industrial products.

Other members elected to the Board of Directors are Carl Kennedy, vice-president; Ernest Hummitch, secretary; and Fred Weihe, production manager. Arthur Neubauer continues as manager

of the automotive jobber division.

The company has announced an aggressive sales promotion program which embraces a number of new product developments.

Gerald B. Duff Appointed Despatch Representative

Despatch Oven Company, 622 S. E. Ninth St., Minneapolis, Minn., has announced the appointment of Mr. Gerald B. Duff, 68 Clinton Ave., Newark, N. J., as sales engineer for Despatch furnaces and core ovens in the Newark-New York territory. This company is proud of this appointment because of the vast experience which Mr. Duff has had in the furnace field. He is thoroughly familiar with the proper handling and heat treatment of all types of ferrous as well as non-ferrous metals and alloys and can be especially helpful to those who are supplying equipment for the National Defense Program.

The appointment of Mr. Gerald B. Duff is another step forward in the Despatch program to give prospective buyers the best of service.

R. E. Scott To Represent Quaker Chemical Products Corporation

According to an announcement made recently by Quaker Chemical Products Corp., Conshohocken, Pa., R. E. Scott has been appointed to the technical sales force in the northern Ohio territory of this firm. His headquarters will be at 320 Beech St., Berea, Ohio.

Mr. Scott was formerly chief chemist at the Marlin-Rockwell Corp., Jamestown, N. Y., and has had extensive experience in the application of cutting oils, grinding compounds, rust preventatives, and both the alkaline and solvent type cleaners used in metal processing.

Aluminum Industries Erect New Plant

Operations in its new $800,000 aluminum and magnesium foundry and aluminum paint plant will start on May 1, according to an announcement by officials of Aluminum Industries, Inc., 2438 Beekman St., Cincinnati, Ohio. This will be the first unit to be completed in

Did you know that . . . .

—A completely conveyorized finishing setup is used in the finishing of automobile service merchandising equipment? See Page 10.

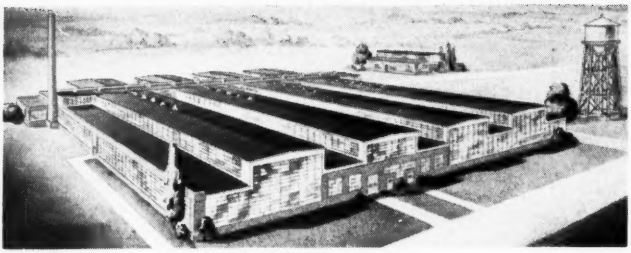
—The temperature of a galvanizing bath can be determined from an examination of dross crystal form? See Page 32.

—Plating gold by means of automatic equipment is both practical and economical? See Page 38.

—Conservation of vital metals can be effected through the proper application of barrel finishing methods? See Page 56.

—A fully illustrated booklet describing radiant heat lamp applications to industrial drying, baking, and heating tasks is being sent to those who request it? See Page 63.

—Literature describing twenty-one items of metal finishing equipment and materials is available? See Page 94.



Architects' Drawing of Aluminum Industries' New Plant

the company's extensive building program, which will include, in addition to the foundry and paint plant, a large machine shop and an office building. All of the new buildings are being erected on a 35 acre site recently purchased by the company on Werk Road, Cincinnati, Ohio.

The new foundry and paint plant, which has an area of 150,000 sq. ft., was designed and constructed by the Austin Company, Cleveland, Ohio. It has modern functional lines and is of all-welded structural steel and face brick construction, with high continuous bands of sash on all sides. Four 50 ft. monitor bays with five intermediate 30 ft. bays are provided in the structure. The plant is being completely equipped with all modern manufacturing and handling facilities.

The enlarged capacity of the new paint plant will be required to meet the added demands of the defense industry for the company's Permite Ready-Mixed Aluminum Paints.

Commercial Solvents Licensing "Hot Lacquer" Process

Commercial Solvents Corporation, 1331 S. First St., Terre Haute, Ind., has announced that it is now granting licenses to lacquer manufacturers and their customers under U. S. Patent No. 2,150,096 which covers the application of lacquers at elevated temperatures. This patent discloses a novel lacquer technique based on the fact that it is possible to apply at elevated temperatures—150 deg. F. to 160 deg. F.; for example, a lacquer containing much larger proportions of solids than has ever before been possible. Because of its convenience and the marked saving in application costs which it effects, the "hot lacquer" process has been adopted by many furniture manufacturers as well as by manufacturers of a wide variety of other products including porous materials, metal articles and

The "hot lacquer" process allows an increase in solids content of 50 per cent to 60 per cent at spraying viscosity. Also these "hot lacquers" can be applied in thicker liquid coats than conventional lacquers with the result that the number of coats required to give any desired thickness of film may be reduced by as much as one-half.

R. W. Luzius Joins Park Chemical Company

The Park Chemical Company, Military and Vancouver Aves., Detroit, Mich., has announced the appointment of Mr. R. W. Luzius to the sales and service department staff in the capacity of grain cement engineer. Mr. Luzius is a technical college graduate, and comes to Park Chemical Company after

R. W. Luzius

9½ years experience at Chevrolet Motor Company bumper shops in Detroit and Saginaw, where he was employed as polishing foreman.

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Report of Central District Enamelers' Club

THE Central District Enamelers' Club held the second meeting of the 1941 season in Cleveland at the Hotel Allerton with 110 members present.

J. B. Simons, Westinghouse, Mansfield, President of the Club, presided at the meeting, the topic of which was "Advantages of New Equipment and Materials." The speakers on the program were R. D. Beck, Tappan Stove Co., Mansfield; Frank Michael, General Electric, Erie; Dan Cherry, Kelvinator, Grand Rapids; Jack Trees, Holland-Reiger, Sandusky; and Normal Stolte, Davidson Enamel Co., Clyde, Ohio.

Previous to the papers, Ross Purdy, Secretary of the American Ceramic Society, and Mr. Vickeroy, English Representative of the Ferro Enamel Corp., were introduced and spoke briefly.

Mr. Beck discussed three pieces of equipment which have been advantageous in enameling operations at the Tappan Stove Co., namely, the "screw type" pump, the plenum chamber, and the portable agitator. The pump referred to embodies a new principle of screw positive displacement, is valveless, and delivers a uniform flow of constant pressure. The pump is light, portable, and economical to operate. It has a capacity of 5 gallons per minute and has pumped as much as 20,000 pounds of enamel per day. The working parts of the pump have given exceptionally good service, and any necessary replacements are moderate in cost and can be quickly accomplished.

The portable agitator which is being used in reclaiming enamels and also in the enamel storage tanks has been a labor and time saving piece of equipment.

The plenum chamber is an air tight, filtered air spray room, with some 15 per cent more air being pumped into the room than is leaving. The principal advantages have been cleaner reclaim and cleaner working conditions.

Jack Trees for his paper related his experiences with "zirconium opacified," or as they are better known, "antimony free" enamels. World War 2 has brought about a shortage of antimony with the result that considerable work has been done using zirconium as a substitute. Zirconium frits differ from antimony frits in that they develop their capacity during the firing rather than in the smelting as is the case with the antimony frits. Due to the clearness in color of this type of frit, it was found necessary to add a dye to the enamel to enable the sprayer to obtain an even coating. The advantages of these frits are higher capacity, wider burning range, good sag resistant qualities when applied to a good ground coat, good coverage of raw edges, no blistering, and good gloss. It is necessary to spray this enamel at a lower specific gravity in order to

obtain a smooth finish, and it was also reported that the firing time has been increased slightly.

Normal Stolte described the anionic-cationic water treatment unit in use at the Davidson Enamel Co., Clyde. Due to the type of hardness of the Clyde water, Davidson had experienced considerable trouble both in the pickle room and in the mill room. Distilled water, which was both expensive and difficult to obtain, proved to greatly help this condition, so it was decided to install a unit whereby water could be "synthetically" distilled. This water treatment unit is composed of two tanks, the first of which contains a bed of carbonaceous zeolite which, when the water passes through this bed replaces the calcium and magnesium ions with H (hydrogen). The second tank contains a synthetic resin which absorbs the chlorides and sulfates, and replacing them with the OH (hydroxyl) ion. The OH ion combines with the H ion to form H_2O. An analysis of this water shows that its purity is comparable to that of distilled water and is obtained at a much lower cost.

Mr. Cherry compared the automatic pickling unit at Kelvinator with the hand type pickle setup used in the past. He pointed out that automatic pickling removes the human labor and error variables, though there are naturally certain mechanical hazards which can be overcome by the use of proper hanging tools, proper ventilation equipment, no curves, and an automatic shut-off to prevent jams. One unusually good idea mentioned was the use of a hot water rinse tank in the setup directly before the ware enters the first cleaner tank. This tank has greatly lengthened the life of the cleaner solutions. In conclusion, Mr. Cherry pointed out that automatic pickling gives better pickled ware at a lower cost for both labor and material than any other method.

Frank Michael of General Electric discussed a subject that is one of importance to most enamelers, that of color matching. Inasmuch as a good color match is essential, General Electric, after deciding that matching by eye was not satisfactory, chose an instrument as the logical method. The prerequisites of this machine were that it must be simple to operate, it must be accurate, it must give permanent calibration, it must have good intensity of light over the spectrum, it must match a large area, and it must give rapid results. The unit now in use which answers the above conditions, consists of a power unit, a measuring hood, and a measuring scale registering directly in per cent reflectance.

General Electric uses but one color in their production. The instrument is calibrated using a standard color plate, and all parts must have similar basic color characteristics. All "rework" and "off-color" parts are sprayed, using a special "color adjusted" enamel. Summing up the advantages of using this instrument we have accuracy, simplicity of operation, control of color matching, and the absence of the necessity of segregating parts according to color.

Pemco Porcelain Enamels Bulletin. The Porcelain Enamel & Manufacturing Company, Eastern and Pemco Aves., Baltimore, Md., is issuing a bulletin describing a series of Pemco trade-marked porcelain enamel frits which were developed especially to fill the specific needs of the industry, and named for easy identification. Some have been known heretofore as Covercotes, some as Groundcotes; others are both the Groundcote and the Covercote in one.

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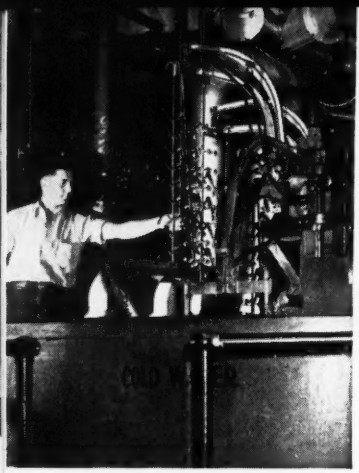
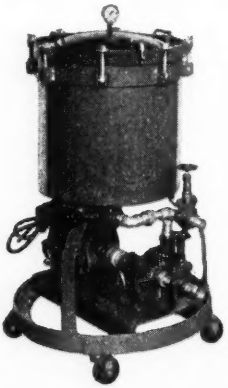


New PLANT EQUIPMENT AND Materials

Sparkler Horizontal Plate Filter

A horizontal plate filter unit for nickel, copper, brass, zinc, cadmium, silver, and chromium plating solutions has been placed on the market by Sparkler Manufacturing Company, 1210 Webster Ave., Chicago, Ill. This acid and plating solution filter is engineered to make use of the modern diatomacious filter aids to the best possible advantage.

The powder filter cake is built up in a horizontal position within an enclosed chamber, which means that the filter can be stopped and started and wheeled about without disturbing the filter cake. The Sparkler Horizontal Plate Filter provides a powder filter that can be easily and quickly cleaned.



Sparkler Horizontal Plate Filter

Sparkler Horizontal Filter Plates are available in acid proof hard rubber. stainless steel, and ordinary steel. Sparkler Filters are available in capacities ranging from 100 to 5000 gallons per hour. The unit is especially adapted for using activated carbon. It is completely enclosed, easy to clean. and occupies minimum floor space. Each unit is equipped with a splash proof motor.

Rowe Nylene

A white synthetic enamel to be known as "Nylene" has been placed on the market by C. L. Rowe Corp., 152 Banker St., Brooklyn, N. Y. This material is said to have unusually high reflectivity.

According to the manufacturer, Nylene will stay white under severe conditions. In actual tests, at 250 deg. F. for 20 minutes, the material shows no discoloration.

Triton NE Detergent

A synthetic, non-electrolyte detergent to be known as "Triton NE" has been developed for metal-cleaning work by Rohm & Haas Company, 222 W. Washington Square, Philadelphia, Pa. This material is said to be a high molecular weight complex organic alcohol, nonionic and readily soluble, even in strong salt solutions. It is manufactured as a viscous, transparent, pale amber liquid.

According to the manufacturer, Triton NE was developed as a completely non-

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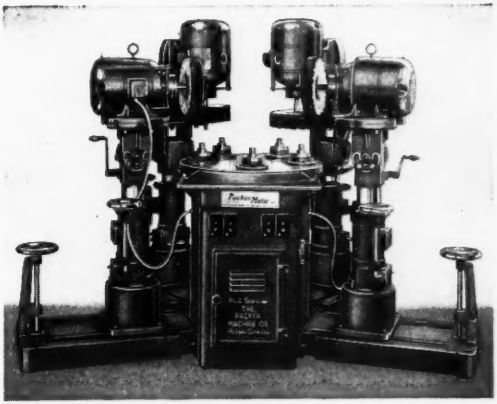

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Packer-Matic

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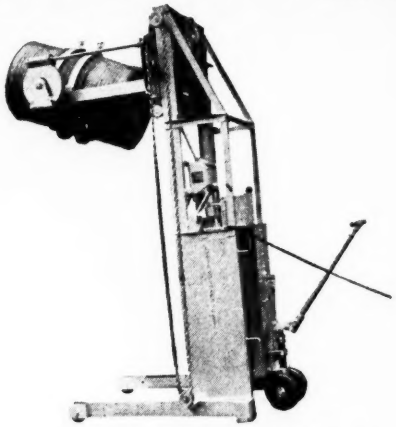
ionic, ash-free material in order to obtain maximum cleaning action in alkaline or acid solutions or in hard water. The material does not settle out, and has the same specific gravity as water. Its complete compatibility with acids, salts, and bases is said to make Triton NE useful in the electroplating and metal-cleaning field.

Lewis-Shepard Drum-Dumping Stacker

Lewis-Shepard Sales Corp., 245 Walnut St., Watertown, Mass., has announced the development of a drum-dumping stacker for smoothly and efficiently handling the dumping of drums, barrels, and other liquid or dry material containers.

This newly improved drum-dumping stacker permits control of the dumping operation by the operator from the floor. This eliminates standing on boxes, improvised platforms and the like.

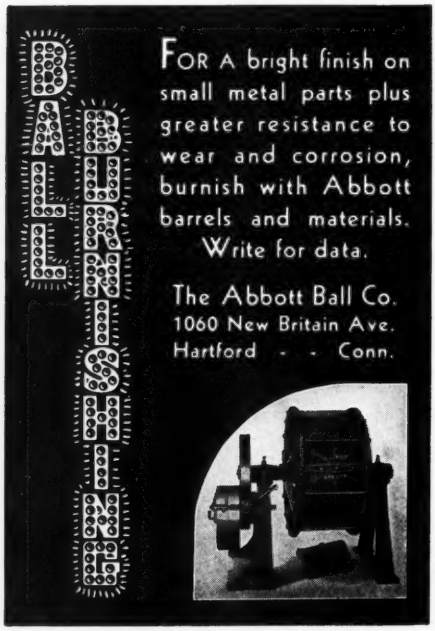
A self-locking worm makes it possible to hold the drum instantly for as long as desired at any position. Control from the floor also permits the operator to reverse the tilt of the drum or barrel to slow down or stop the flow of material from the container.



Lewis-Shepard Drum-Dumping Stacker

The versatility of this improved drum-dumping stacker plus its inherent ruggedness and efficiency of operation make it an especially valuable piece of equipment just at this time.

Lewis-Shepard Company designs and manufactures many different types of special purpose stackers for dumping, storing, piling, the retention of materials at bench or work level, and handling materials on pallets.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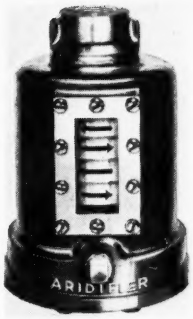
Air Cleaner Manufacturer Employs Novel "Tell-All" Unit

In order to show prospective users just what happens inside an Aridifier air cleaner and to prove that back-pressure is a negligible factor, the Logan Engineering Company, 4912 Lawrence Ave., Chicago, Ill., is using a standard model of this device with a window set in the housing wall.

By this procedure, it is possible when one of these units is installed in an air line to see each rotor pick up speed as air is applied to the line. An arrow painted on the edge of each rotor indicates the direction of rotation and shows how each rotor quickly picks up speed.

When the rotors are at operating speed, it is a simple matter to see each rotor from the bottom up discharge drops of water and oil and flecks of dirt as they are removed from the air stream and deposited in the dead air zone.

It is claimed that these units will remove all condensed moisture, oil, and fine scale from air and gas lines and that even under 24 hours per day continuous operation, no maintenance is required, as rotors are balanced on grease-packed bearings and there are no parts to wear, clog, or become inoperative. Units need no attention other than periodic drawing off of accumulated water and dirt from the traps.



Window-Equipped Aridifier Unit

"Nicholson" Model JR Weight-Operated Trap

Illustrated herewith is the "Nicholson" Model JR Weight-Operated Trap for automatically draining water and oil from compressed air after-coolers, separators, receivers, and so on, which is now being manufactured by W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa. The trap is designed for air or gas pressure up to 125 lb., and can also be used for saturated steam service up to 125 lb. pressure.

The body and cover of the unit are constructed of cast iron, with all internal parts of either bronze or stainless steel. The valve and seat are of hardened stainless steel, accurately ground and tested under pressure. The float is of welded Type 302 stainless steel construction and is said to be guaranteed against collapsing.

In operation, water entering the trap raises the float to its highest point of travel where it releases the weight latch, thereby allowing the counterweight to fall. The counterweight is

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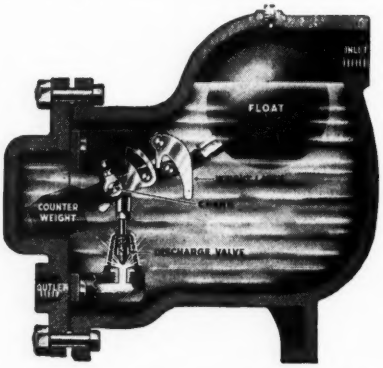
attached to a crank which lifts the discharge valve wide open instantaneously. The discharge valve is then held wide open by the link latch until the discharging water carries the float to the lowest point of its travel. At this point, the weight latch again engages the



"Nicholson" Model JR Weight-Operated Trap

counterweight, which has been lifted by the falling float. and the link latch disengages, thereby permitting the discharge valve to close instantaneously. Wire-drawing of valve and seat is said to be entirely prevented by this intermittent, rapid opening and closing of valve.

Although utilizing a float which is necessary to its action, the Nicholson Model JR Trap is not what is commonly termed a "float-operated" trap. The float is instrumental only in releasing the counterweight which, as it falls, opens the discharge valve. Opening and closing of the valve does not depend upon the buoyancy or weight of the float. The Nicholson Model JR Trap is float-actuated, but not float-operated.

Specifications of the trap are as follows: pressure lb. per sq. in., 10 to 125; capacity lb. per hr., 870 to 2,465, depending upon the pressure lb. per sq. in.; approximate capacity per discharge, 5½ lb.; shipping weight, 37 pounds.

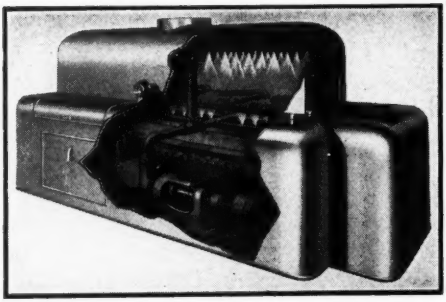
Marlox Plastic Coating

A plastic coating for metals to be known as "Marlox" has been placed on the market by Marley Chemical Co., 983 E. Milwaukee, Detroit, Mich. This material can be used either as a priming coat or for protection against rust and corrosion only.

According to the manufacturer, there is an absence of porosity. Marlox can be applied by spraying, painting, or dipping to form a thin, flexible coating on any metal to which it is applied. It is particularly applicable to furnishing adequate protection against corrosion and rust creepage at weld seams and folds. Marlox dries quickly and can be handled in 5 to 10 minutes after applying. A one hour drying time is recommended where possible before applying enamels and paints. The material can be applied to steel, cast iron, aluminum, aluminum alloys, magnesium alloys, copper, brass, cadmium plate, and galvanized or zinc coated steel.

Birdseye Infra-Red Heat Lamps

Three infra-red heat lamps have been placed on the market by Birdseye Division of Wabash Appliance Corporation, 345 Carroll St., Brooklyn, N. Y. Two of the lamps are clear, for use with standard gold-plated or Alzac reflectors, and the third does not require and sepa-



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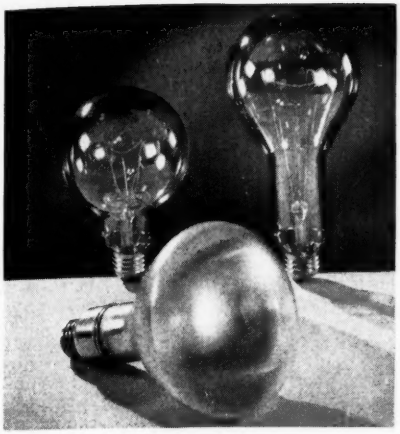

Birdseye Infra-Red Heat Lamps

rate reflector since it is constructed with its own reflector lining sealed inside to keep it free from oxidization and the collection of dust, dirt, and fumes.

According to the manufacturer, the reflector lining will keep heat-reflecting value for the 6,000 hour life of the bulb because it is constructed of pure solid silver and sealed inside the gas-filled bulb. Differing from incandescent lamps used for lighting, the filaments of the Birdseye Infra-Red Lamps operate at lower temperatures, developing infra-red energy at wave lengths that have high penetration. One of the properties of these lamps and of the infra-red radiant energy developed in said to be the penetration deep down into the surface films of lacquers, paints, and enamels.

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M.S.A. Respirator Eyeshields

Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh, Pa., has announced an M.S.A. Dustfoe-Eyeshield Assembly and Comfo-Eyeshield Assembly. These units are said to furnish respiratory protection against invisible particles of harmful dust, and guard the wearers' eyes from flying dust and grit by a light, durable, transparent plastic shield.

The M.S.A. Eyeshield is designed to deflect small flying particles, and affords full, unobstructed vision. It is removable and replaceable and has a rubber-reinforced edge.

All the advantages of the popular Dustfoe Respirator are retained in the M.S.A. Dustfoe-Eyeshield combination. The respirator is compact, permits unobstructed vision in every direction, and features U. S. Bureau of Mines approved protection against harmful dusts, low breathing resistance, easy maintenance, soft sponge-rubber face cushion, foolproof exhalation valve and protective filter cover. The "all-dusts" filter is quickly replaceable. Metal parts are aluminum.

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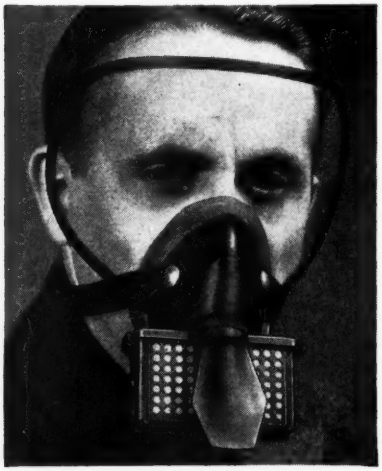
Weldon Roberts Rubber Co., Newark, N. J., U. S. A.

sembly, the wearer has the complete protection provided by the husky, long-time favorite Comfo-Respirator. The



M.S.A. Respirator Eyeshield

unit is equipped with twin filters of unusually large area for low breathing resistance. The replaceable filters are protected by metal covers, and the flexible rubber facepiece provides a comfortable fit on any face. All filters either for dust, fumes, or mist are approved by the U. S. Bureau of Mines.

These compact new M.S.A. assemblies offer day-long wearing ease and safety to workers in dust-laden atmosphere, furnishing full respiratory safety plus durable eye protection.

Insulmat No. 595

Weather and temperature changes can play some queer pranks, but none is more costly than condensation collecting on ceilings and side walls of freight cars, cargo ships, in storage houses, air ducts, water pipes, and so on.

Damage from sweating or dripping water on raw materials, food products, furniture, and other merchandise that must be shipped from place to place or kept in storage awaiting disposal, runs into high figures every year.

Now there has been developed in the plant of the J. W. Mortell Company, Kankakee, Ill., a product called Insulmat No. 595. It is a spray-on plastic compound, containing specially treated cork particles, which is said to eliminate condensation drip.

Insulmat No. 595 is self-bonding, requires no priming coat, adhesive or supports, and can be applied to any metal surface. Insulmat No. 595 is said to give positive protection. There is no upkeep and it is said to last as long as the metal to which it is applied.

Insulmat No. 595 has been subjected to intensive vibration and other severe tests under various conditions and has been found to possess unusual adhesion, to be odorless, and to form a valuable protective coating on metals.

Yale & Towne "Load King" Hydraulic Hand Lift Truck

A hydraulic hand lift truck featuring easy lift, easy steer, great safety to operator, low maintenance, and controlled lowering of loads, to be known as the "Load King," is now being offered by The Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia, Pa. The truck

"Machine - Glazing" KNIVES with "Indian Brand" 4F Turkish Emery

24 blades are polished at once with 4F Turkish Emery at the W. R. Case & Sons Cutlery Company, Bradford, Pa.

Absolute uniformity, longer wear and prompt delivery. *Write for your trial lot today.*

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Yale & Towne "Load King" Hydraulic Hand Lift Truck

is built for continuous heavy duty service and is available in capacities of 3,500, 5,000, 6,000, and 8,000 lb. All parts are specially made for hand lift truck service, and the design, it is claimed, makes maximum use of every construction feature essential to perfect heavy duty hand lift truck operation.

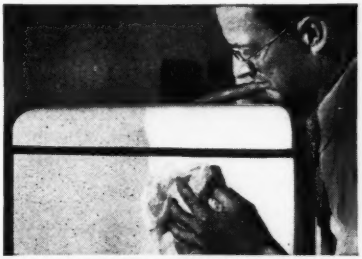
The hydraulic lifting unit of the Yale Load King is self-contained and totally enclosed, and is provided with a 5-pint oil reservoir to eliminate frequent refilling. The pump is equipped with automotive type piston and piston rings which are said to guarantee maximum pressure at all times, and is fully guarded and protected from outside shock and possible damage. Hardened and ground automotive type poppet valves operating on hardened and ground valve seats ensure trouble-free operation.

The large diameter lift ram is solid steel, precision ground and polished. The ram operates in a cylinder equipped with Chevron leather seals encased in bronze bushings, thereby assuring maintenance of oil pressure to support loads in elevated position. The large size ram, according to the manufacturer, lowers oil pressure 50 per cent, increases packing life, and greatly reduces possibility of valve leakage.

The one-piece frame of the Load King serves the double purpose of elevating platform and elevating frame. All parts, including frame, rear wheel assembly, and front head assembly, are designed with a maximum factor of safety. Front head and wheel fork are heavy section steel castings, precision machined for accurate fitting. A large Timken thrust bearing on the steering column provides easy steering of heaviest loads.

Front and rear lifting links are steel castings with broad bearing surface, and are equipped with hardened steel bushings and pins. Links are connected by means of high carbon, heavy steel bars. Rear wheel links and axle housing are a one-piece unit, thereby adding strength and stability to truck construction. Wheels are smooth machine faced steel and are equipped with ball bearings sealed to exclude dirt and other foreign matter.

For easy maneuvering, the Yale & Towne Load King Hydraulic Hand Lift Truck features a full 200-deg. lifting and steering arc. The truck is provided with a balanced tubular handle, the comfortable, chrome-finished hand grip, tubular shaft, and lower handle casting being welded into a single unit to prevent parts from working loose. The balanced handle relieves operator of car-



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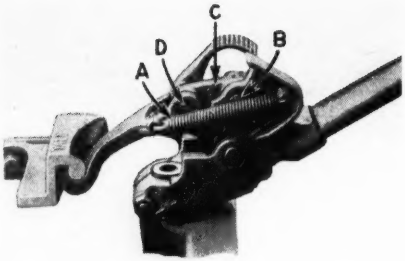


Cut-Away View of Hydraulic Mechanism

rying handle weight, and also prevents accidents from workmen tripping. Load platform and lifting saddle are reinforced heavy plate and bar steel arc-welded into a rigid unit structure to withstand continuous heavy duty service.

The finest materials obtainable are used in the manufacture and construction of the Yale & Towne "Load King" Hydraulic Hand Lift Truck.

Ebonol "Z"

An immersion process for blackening zinc and its alloys to be known as "Ebonol Z" has been placed on the market by The Enthone Company, 442 Elm St., New Haven, Conn. The process consists in immersing the zinc alloy in a one pound per gallon solution of "Ebonol Z" in one gallon of water, at a temperature of from 150 deg. F. to 212 deg. F. An adherent, jet black finish is formed in from one to five minutes.

The work can be cleaned in alkaline cleaners or degreased with solvents and acid dipped similarity to preparing work for plating, before being treated in the blackening solution. According to the manufacturer, one pound of salts will blacken over 150 sq. ft. of zinc surface. The bath is not critical and requires little control.

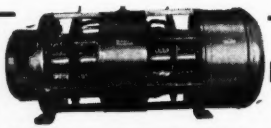
It is reported that the Ebonol Z solution can be used for producing a black coating on stainless steel, nickel silver, nickel, and noble metals, by making a couple with these metals and a piece of zinc. This can be done by using a zinc basket or by fastening a sheet of zinc to the rack or basket in which the metals are to be blackened. The process is stated to be particularly valuable for nameplate finishing where recesses are to be blackened, for blackening of etchings on rules, squares, tools, and so on.

It can be used for blackening zinc plated or hot galvanized surfaces, as well as for solid zinc or its alloys. The blackening process is stated to be particularly timely for armament purposes, as it allows the blackening of zinc and other metal surfaces to reduce or eliminate glare and, in addition, the thinness of the coating obviates any possible difficulties from a dimension tolerance standpoint. Unlike plated or enameled coatings, the Ebonol Z coating does not change the thickness of the piece more than a few hundred thousandths of an inch, and thus close dimensions can be maintained.

The company reports that it will be pleased to blacken sample parts for examinations or tests, and is prepared to render engineering service on the blackening of zinc, stainless steel, steel, and other alloys.

Want to Improve Your Paint Job?

At no extra cost you can give your customers a better, longer-lived paint job. RUSTICIDE "50" not only cleans but also mildly etches and effectively rust proofs the surface. This inexpensive, non-toxic liquid is easy to handle, removes grease and rust, leaving an ideally toothed surface ready for immediate painting. Write us discussing your operation and we will send complete data. Rusticide Products Co., 3125 Perkins Ave., Cleveland, O. Est. 1920.



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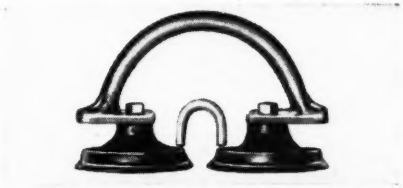
MOTOR GENERATOR CORP., Hobart Square, Box PF-51, TROY, OHIO

"Sure-Grip" Eveready Lifters

J. R. Clancy, Inc., Syracuse, N. Y., is now manufacturing a line of devices for use in handling sheet metals and other smooth surface materials to be known as "Sure-Grip" Eveready Lifters.



"Sure-Grip" Eveready Lifter No. 2-B Designed for Lifting Approximately 120 Pounds

Made in many sizes and styles to fit various applications on plain or oiled surfaces, Sure-Grip Eveready Lifters are designed for handling sheet metals, glass, and other smooth surface materials to or from stock piles, to or from machines, or in processes of construction or fabrication.

The pressure of vacuum cups to the surface of the material results in a positive grip which is maintained until after the material has been conveyed to its destination. The flip of a finger then

"Sure-Grip" Eveready Lifter No. 479 for Feeding Small Blanks

automatically releases the vacuum and frees the Sure-Grip Lifters.

Sure-Grip Eveready Lifters are built for heavy duty service and are provided with stout handles shaped for comfortable handling.

Oxy-Dul

An oxidizing liquid of high concentration known as "OXY-DUL" has been placed on the market by the American Products Corporation, 3523 N. Halsted St., Chicago, Ill. "OXY-DUL" liquid as an oxidizer powerfully strong when as little as a teaspoonful is required to one gallon of water for ordinary oxidizing.

OXY-DUL is used in processing the surfaces of brass, bronze, copper, silver, steel, iron castings, and so on. While the quantity of the liquid used is general for all metals, in most cases the treatment varies and calls for special directions which will gladly be furnished upon request, also a fair sized sample for tests.

High Wattage Industrial Lamp

A new type high wattage lamp, recently announced by the Radiant Lamp Corp., 258 Sherman Ave., Newark, N. J., is said to enable industries working at night on the defense program to increase their illumination up to 250 per cent or more without changing fixtures. The use of a hard glass bulb has made it possible to reduce the size of a 500 watt lamp to that of an ordinary 200 watt lamp and also permits the lamp to withstand thermal shocks when used outdoors. The new lamp was originally

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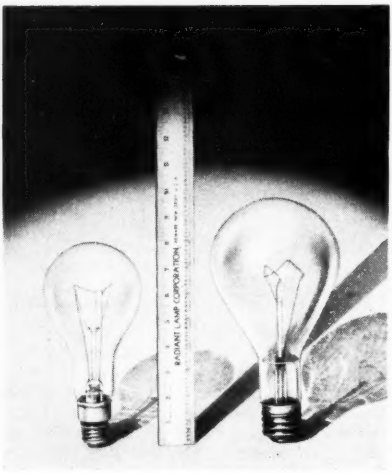

High Wattage Industrial Lamp

designed for use in explosion-proof fixtures.

In place of the large "mogul screw" base and heavy fixture necessary to support the weight of an ordinary 500 watt lamp, the new lamp made by the Radiant Lamp Corp., can use a "medium screw" base like those in ordinary household fixtures. The hard glass Radiant Lamp is said to withstand the sudden shocks of rain or sleet without cracking. Other size industrial lamps up to 10,000 watts are now being made to meet special requirements in various industries.

Acromark

A method of marking enameled metals without engraving has been discovered by the Acromark Corporation, 251 N. Broad St., Elizabeth, N. J. This method is said to reduce marking time and to provide attractive results.

The process consists primarily of a steel die application to the coated metal under electrically controlled conditions and the mark of metal or color pigment is the result.

Binocular parts, enameled tubes, camera parts, instrument cases, and a wide variety of enameled metal products can be trade-marked, numbered, or otherwise marked by this process. A special machine to simplify the marking procedure has also been developed by this company. According to the manufacturer, this method of marking should reduce very greatly the cost and production time of numerous instruments and articles vital to national defense.

Schneible Type "UC" Unit Dust Collector

The Claude B. Schneible Co., 3951 Lawrence Ave., Chicago, Ill., is announcing a unit dust collector in 2,000 to 10,000 c.f.m. capacities. Designated as the Type "UC," the collector consists of a fan, five-spray curtain tower, pump, settling chamber, and sludge ejector-conveyor. The collector tower is of conventional Multi-Wash design employing water in a cyclonic wash action to absorb dust and fumes on impingement plates and vanes.

In operation, heavy particles are precipitated in the lower inlet cone of the collector, fines being collected and washed back into the sludge chamber by the downward moving water spray curtain.

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NYLENE
WHITE SYNTHETIC ENAMEL

Mar proof and alkali proof. Bakes from 150 F. to 450 F. in 10 to 30 minutes.
High reflection test. Forever white
Samples on request

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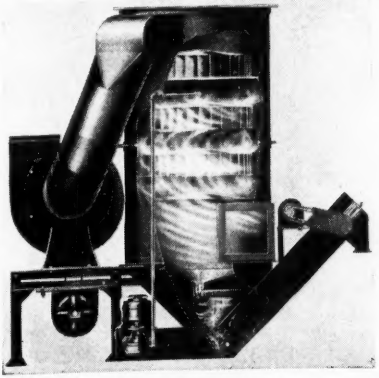
For a real good polishing job use

KEYSTONE EMERY

TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila, Pa.

The Schneible Type "UC" Dust Collector has no moving parts. The sludge ejector-conveyor operating at slow speed

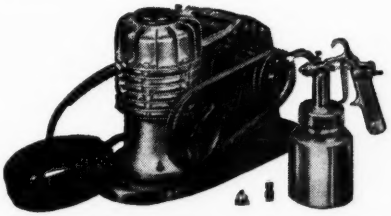


Schneible Type "UC" Unit Dust Collector

removes sludge from the precipitation chamber, dewaters it in the conveyor, and discharges it into any convenient receptacle. The collector occupies a minimum of floor space and is said to require a negligible amount of maintenance.

Speedy Sprayer No. 890

W. R. Brown Corporation, 5720 Armitage Ave., Chicago, Ill., has announced a speedy sprayer model to be known as the No. 890. This is a ¼ h.p. unit that is designed for general spraying purposes.



Speedy Sprayer No. 890

The No. 890 Speedy Sprayer can be used in the workshop or factory and is built for steady, long-term use. The Speedy Sprayer employs the diaphragm principle which is said to eliminate air from contacting oil, and thereby assures a clean paint job, free from oil spots.

P&H Zip-Lift Electric Wire-Rope Hoist

A full electric wire-rope hoist is announced by the Harnischfeger Corporation, Milwaukee, Wis. Known as the P&H Zip-Lift, the hoist has been designed for flexible handling service in all lines of industry. It is light enough for a man to carry; it can be mounted rigid, or on a hook or trolley—with mountings interchangeable when desired. It operates with pushbuttons and is powered from an ordinary light circuit.

Features of the P&H Zip-Lift include double brakes for safety of loads, automatic limit switch to prevent loads from rising too high and jamming the hoist drum, and fully enclosed construction making the unit impervious to dust, fumes, acid, or weather conditions. Because it is a genuine wire-rope hoist. the P&H Zip-Lift permits a wide lati-

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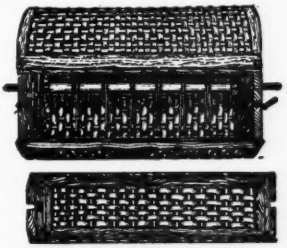
BETTER
SIZES FOR ANY EQUIPMENT



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P&H Zip-Lift Hoist Mounted on Trolley

tude of side pull, an advantage in reaching beyond aisles for loads. Furthermore, the pushbutton cable is anchored to the hoist frame itself so that the operator can pull the hoist along a trolley by means of the cable itself.

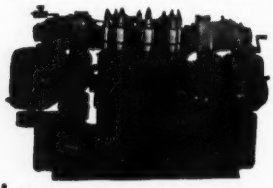
The hoist is recommended for raising and positioning parts on machine tools, for handling heavy loads on delivery platforms or in storage rooms, and for inter-departmental transporting of materials. It is available in 250, 500, 1000 and 2000-lb. capacities.

CM One-Ton "Comet" Electric Hoist

The Chisholm-Moore Hoist Corp., 140 Fremont Ave., Tonawanda, N. Y., has announced a one-ton capacity "Comet" as an addition to its line of lightweight, portable, plug-in type "Comet" electric hoists. The addition of this model now makes the Comet Hoist available in five capacities; namely, 250, 500, 750, 1,000, and 2,000 pounds.

The one-ton Comet is rugged and compact in design and is suitable for all types of hoisting service. It is available with hook suspension for quick, easy portability, or with a trolley attached for overhead conveyance. Special heavy-duty, high-torque motors are supplied for either 110-volt lighting circuits or 220 or 440-volt power lines. Except for its larger capacity, the one-ton Comet, like the smaller size units, is designed to save time and energy on hoisting operations, and offers the same advantages of efficient operation.

The CM One-Ton Comet Electric Hoist is precision built throughout. Precision, double plate sealed, permanently lubricated ball bearings are provided at all rotating points. Gears are accurately machined and are made of long wearing heat-treated alloy steel. The load brake is smooth, quick-acting, and positive, and thereby prevents "drifting" of the load. An emergency brake plus automatic upper and lower limits guard against hoist abuse and ensure complete safety. "One hand" control provides conveniences in operation since it leaves the other hand free to direct



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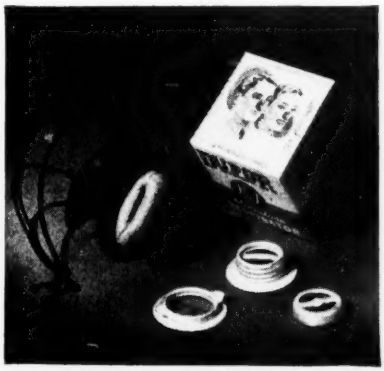
CM One-Ton "Comet" Electric Hoist

the load into position. The CM Herc-Alloy Chain with patented "Inswell" welded links is strong, flexible, and kink-proof.

Dupor No. 1 Respirator

The miniature Dupor No. 1 nuisance dust respirator recently announced by H. S. Cover, 1931 Chippewa, South Bend, Ind., has been made even lighter through the use of molded plastic valves. The total weight of the entire unit is said to be now reduced to well under one ounce.

The Dupor No. 1 Respirator is designed to fit over the nose only and is held in place by elastic ear bands, and can be worn as conveniently as a pair of glasses. The nosepiece is of soft rubber with a 9 sq. in. filter pad. The new plastic valve arrangement prevents stale air from backing up inside the filter pad and expels breathed air instantly.



Dupor No. 1 Respirator

Westinghouse 2-FPR-100 Fluorescent Luminaire

A fluorescent luminaire employing two 100-watt, 60-in., white, or daylight fluorescent lamps and designed especially for general and supplementary high-level illumination in industrial or commercial areas is announced by the Westinghouse Electric & Mfg. Co., Lighting Div., Edgewater Park, Cleveland, Ohio. The luminaire, which is designated as the 2-FPR-100, is said to be ideal for supplying the high intensities needed in plants where production

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is used and recommended as a clear coating for hand tools, machine tools, hardware and wherever a clear protective coat for bright metal is required.

The Varnish Products Co.
5208 Harvard Ave. Cleveland, Ohio

is being speeded, and is available for operation on 110-125, 199-216, and 220-250 volts, 60 cycle alternating current.

The luminaire consists of a hood, reflector, lamp holders, starting device, and ballast equipment. Access to line connections is easy since all auxiliary equipment is mounted and wired as part of the sheet steel hood assembly. Reflector is of 18 gauge porcelain enameled steel and is available in two types; namely, a direct type which throws all light downward, and a diffuser type which permits a minimum of 2½ per cent upward light to pass through apertures above each lamp to reduce brightness contrast between the lighted area and the ceiling. Both type reflectors provide a 14-deg. shielding angle below the horizontal when viewed normal to the lamps.

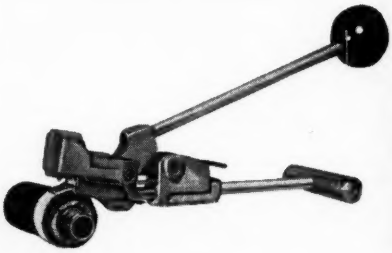
Two-lamp ballast provides a power factor of over 90 per cent, and minimizes stroboscopic effect.

Punch-Lok Hose Clamp

The Punch-Lok Hose Clamp shown in the illustration herewith, product of the Punch-Lok Co., 428 N. Wolcott Ave., Chicago, Ill., is a mechanical device for connecting various kinds of male and female fittings, special nipples, menders, or ordinary pipe to a hose. This modern streamlined clamp will find application on all hose from the modern high pressure wire woven and braided hose used in the control of hydraulic machines such as coal excavators, road scrapers and snow plows; acetylene, burning, pneumatic tool hose; sandblast hose or any kind of flexible coupling between rigid pipe lines or fittings; hose for air, steam, hot liquids, chemicals, and oil, down to automobile gasoline and air hose. Once the Punch-Lok Hose Clamp has been locked, vibration or rough handling, it is claimed, cannot loosen it.

A broad, flat, high tensile strength galvanized steel band is double wrapped around the joint of the clamp, and after tensioning with a pull of 1,000 lb. within a Loking-Tool, the ends are firmly locked together without loss of tension within the flat pressed steel clip. The excess band is cut off flush with the clip so that the entire joint is streamlined for safety. The sturdy Loking-Tool and hammer punch together with the quick break-off of the tailpiece assure easy and safe application of the hose clamp.

The Punch-Lok Hose Clamp is available in high tensile strength galvanized steel or 18-8 stainless steel. A single hose clamp is sufficient for all ordinary commercial pressures. Two clamps and a double groove fitting are desirable wherever steam, chemical solutions, hot liquids, and so on, are present.



Punch-Lok Hose Clamp

O-G Burner

According to The Oil-Gas Combustion

BLACK for Iron and Steel

Original, low temperature, patented method

One salt; one bath; one control; one operator. Protects and beautifies; lowers finishing costs; speeds production.

Ask for details. Sample JETALized free.

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PROVIDENCE, R. I.

the JETAL process

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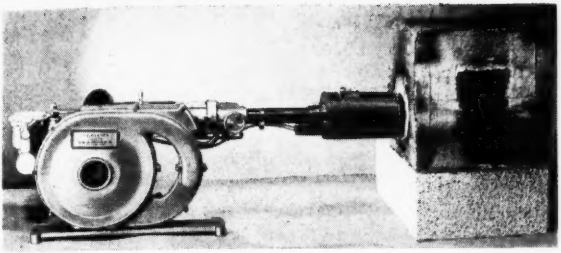

O-G Burner

Co., Inc., 17 Whitney Ave., New Haven, Conn., the O-G Burner shown here employs a new art in the use of oil as a fuel for industrial heating. The burner is a portable self-contained unit which converts fuel oil into a gas.

The O-G Burner consists of a two stage blower, a constant level oil valve, mercury switches, air and oil connections, and a combustion chamber constructed of heat resistant alloys, which eliminates the need for building a compartment to facilitate combustion. Complete gasification of the oil is accomplished within this chamber. By creating a gaseous fuel from the oil, an homogeneous mixture of fuel and air is attained, and since no excess air is necessary to complete combustion, the atmospere is readily controlled so as to produce a reducing, oxidizing, or neutral atmosphere, as may be required.

Specifications of the O-G Burner are as follows: height, 10 in.; length, 20-25 in.; weight, 23 lb.; fuel, oil gas generated from range oil or No. 1 fuel oil; heat output, 25,000-135,000 B.T.U. per hour; motor, 1/40 h.p. induction type 110-120 volts, 3,400 r.p.m.; air pressure, maximum 4½-in. water pressure; operation, continuous or intermittent.

Stanley Heavy Duty Sander

A heavy duty, powerful sander designed for all types of production and repair work is announced by Stanley Electrical Tool Div., The Stanley Works, New Britain, Conn. The mechancial refinements of the sander combined with the compact design make available a long-life tool for fast, efficient sanding, buffing, and surfacing on wood, metal, and concrete.

Features of the sander include a powerful, well-ventilated universal motor; strong aluminum alloy housing; seal type ball bearings on armature and spindle to retain lubricant and exclude dust and dirt; heavy duty full ball bearing spindle construction that assures permanent alignment of gears; heavy duty nickel steel precision spiral bevel gears; slide action, double pole switch, dustproof, totally-enclosed, and conveniently located in handle; bevel type flexible pad of molded sisal fiber to assure smooth, even work, and side handle tha can be used on either side of tool.

The Stanley Heavy Duty Sander is furnished complete with bevel type flexible pad, 6 abrasive discs (3 for metal and 3 for wood), wrenches, and heavy rubber-covered three-wire cable. A felt rubbing pad, lambs wool polishing bonnet and pad, and wire torque brush are available as accessories. Flare cup grinding wheels can be used with the

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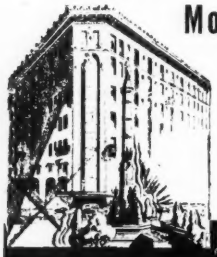

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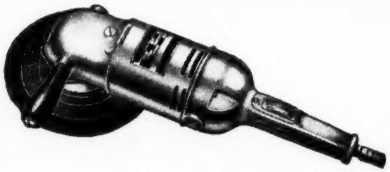
sander for smoothing welds and surfaces where considerable metal is to be removed.

The heavy duty sander is available in two models; namely, a No. 72 and No.



Stanley Heavy Duty Sander

92. The No. 72 sander is equipped with a 7-in. diameter disc, has a speed of 4,200 r.p.m., and weighs 17¼ lb. The No. 92 unit has a 9-in. diameter disc, a speed of 330 r.p.m., and weighs 18 lb. Both model sanders have a universal type motor which operates on either d.c. or a.c., 60 cycles or less. The motor is available in a voltage of 115, 125, 150, 220, 230, or 250 volts.

Stepped-Up Production and the Roto-Clone. A folder describing the service offered in the solution of dust problems is now being issued by American Air Filter Co., Inc., 705 Central Ave., Louisville, Ky. According to this folder, Roto-Clone dust control is recommended where stepped-up production has made grinding dust a problem.

A copy of this folder will be sent free upon request.

Pre-Finished Metals for Fluorescent Lighting Fixtures. A folder describing bright and satin finishes in sheet and coil stock especially recommended for use in the construction of fluorescent lighting fixtures is now being issued by American Nickeloid Co., 1320 Second St., Peru, Ill. Samples of the metal which is being offered for fluorescent lighting fixture purposes are attached to the folder.

A copy will be sent free upon request.

"Rubbers, Natural and Synthetic" is the title of a paper given by J. W. Schade, director of research of the B. F. Goodrich Company, before the annual meeting of the Institute of Aeronautical Sciences. The paper has been

reproduced in mimeographed form and is now available upon request to the Public Relations Department of the company in Akron, Ohio. The paper presents a comprehensive discussion of the entire field of natural and synthetic rubbers, their properties and applications.

Quadrafos Properties and Uses. Rumford Chemical Works, Rumford, R. I., has released Industrial Bulletin No. 64 on "Quadrafos"—brand name for sodium tetraphosphate. The brochure lists many industrial applications, describes chemical and physical properties and characteristics which make the product the solution to many industrial problems. Its ability to condition hard water, deflocculate solids, and prevent corrosion suggests many new fields for investigation.

Copies of the bulletin are available on request.

"The Facts About Protective Drum Linings for Steel Containers" is a brochure which will be of interest to the soap, food products, beverage, petroleum and other industries where products are packed in steel drums or containers. Published by Ault & Wiborg Corporation, 75 Varick St., New York City, the book contains a comprehensive study of the various types of lacquer linings used to protect packaged material from contamination or deterioration through contact with the steel containers in which they are shipped.

The brochure points out that care must be exercised in selecting a protective lining for specific application, since the resistance characteristics required will vary considerably with different products. Tables are included which show how many coats are necessary. Descriptions of the specific linings are also contained in the book, with laboratory data and recommendations for application.

A copy of "The Facts on Protective Drum Linings" is available to manufacturers free upon request.

Hycar Synthetic Rubbers. An excellently illustrated eight-page booklet on the new Hycar group of synthetic rubbers, manufactured by the Hydrocarbon Chemical and Rubber Company, 335 S. Main St., Akron, Ohio, is now available upon request to the manufacturer and is of interest to everyone interested in the general subject of synthetic rubber. The booklet is written in non-technical language, easily understood by those not directly in the rubber field.

Hydrocarbon Chemical and Rubber Company was jointly formed last year by The B. F. Goodrich Company and the Phillips Petroleum Company.

The booklet relates how the Hycar type of synthetic rubber is handled like natural rubber, describes the physical characteristics of Hycar O. R., an oil resistant type of synthetic rubber. lists the comparative properties of Hycar O. R, and natural rubber and pictures some of the steps in the manufacture of Hycar.

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• This Opportunity Section is available for classified advertisements featuring equipment, employment, business opportunities, etc., in the industries devoted to the cleaning, plating, polishing and finishing of metals. For advertising rates and other information address:

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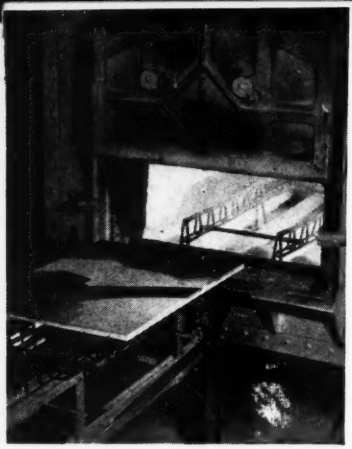

FOR YOUR Catalog LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Kocour Analytical Sets.

A folder describing Kocour Analytical Sets for the control of alkaline cleaners and acid pickles is now being issued by Kocour Company, 4724 S. Christiana Ave., Chicago, Illinois.

2. Ross Unit Heaters

A fully illustrated 8-page catalog describing unit heaters manufactured by J. O. Ross Engineering Corporation, 350 Madison Ave., New York, N. Y., is now being issued free upon request.

3. Shell and Tube Heat Exchangers

A bulletin describing "Leverlox" design for heat exchangers is now being issued by Heat Transfer Products, Inc., 90 West St., New York City.

4. Hammond Variable Speed Lathe

A four-page folder illustrating and describing a method by which speed changes of 1,500 to 3,00 r.p.m. can be obtained instantly on the Hammond VRO Polishing and Buffing Lathe is now being issued by Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Michigan.

5. Du Pont High Speed Brass

The Electroplating Division of E. I. du Pont de Nemours & Company, Wilmington, Del., is now issuing a catalog describing an electroplating process for the rapid production of smooth, bright brass deposits.

6. Industrial Ovens

An illustrated industrial oven book featuring safety, speed, economy, and efficiency in industrial drying and finishing processes is now being issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio.

7. Orvus for Alkaline Cleaning Baths

All those engaged in metal cleaning operations will be interested in information regarding an alkaline cleaning bath addition agent known as Orvus now being distributed by Procter & Gamble Co., Gwynne Bldg., Cincinnati, Ohio.

8. Globe Finishing and Tumbling Barrels

One of the most completely illustrated catalogs on finishing and tumbling barrels for metal parts is now being issued by The Globe Machine & Stamping Company, 1250 W. 76th St., Cleveland, Ohio.

9. Textured Enamel Finish

An improved textured enamel finish known as Rincontrol is fully illustrated and described in a folder now being issued by Roxalin Flexible Lacquer Co., Inc., Box 713, Elizabeth, New Jersey.

10. Finishes for Jewelry and Novelties

Five standard finishes for jewelry and novelties, rhodium, white gold No. 2, Wite brass, and gold smut base finishes are described in a folder which is now being issued by the Alrose Chemical Company, 80 Clifford St., Providence, Rhode Island.

11. Airway Ventilated Buffs

Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 20-03 41st Ave., Long Island City, New York.

12. Metal Cleaning Tips

The chemical classification and selection of alkaline metal cleaners is contained in a bulletin which has been prepared and is now being distributed by the Cowles Detergent Company, 7016 Euclid Ave., Cleveland, Ohio.

13. Grinding Wheel Data Book

A 112-page catalog containing complete descriptive information about the manufacture, use and application of grinding wheels is now being issued by Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pennsylvania.

14. Finishing Equipment Catalog.

A very complete catalog illustrating and describing finishing equipment of all kinds is now being issued by Industrial Sheet Metal Works, 630 E. Forest Ave., Detroit, Michigan.

15. Hy-Speed Filter Equipment for Plating Solutions

An 8-page catalog now being issued by Alsop Engineering Corporation, 8 Bright St., Milldale, Conn., describes an entirely new approach to the problem of keeping plating solutions clean.

16. Milburn Gas and Air Regulators

A special portfolio describing Milburn single, two-stage, and ball seat type gas and air regulators is now being issued by The Alexander Milburn Company, 1436 W. Baltimore St., Baltimore, Md.

17. Synthetic Resin Cements

An 8-page catalog describing Asplit Cement Powder and Asplit Cement Solution for the preparation of mortar to be used in laying acid-proof brick is now being issued by Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelphia, Pennsylvania.

18. Dust Control

A complete story of dust control in words and pictures by means of Roto-Clone dust control equipment is now being issued by American Air Filter Company, Inc., 702 Central Ave., Louisville, Kentucky.

19. Cleaning of Metals Before Electroplating

A 32-page booklet outlining formulas and methods for cleaning many different metals and alloys before electroplating is now being issued by Oakite Products, Inc., 20 Thames St., New York City.

20. General Electric Reactrol System

Eight ways in which the Reactrol system gives exact temperature control are described in a bulletin now being issued by the General Electric Company, Schenectady, New York.

21. The Waco Catalyst

Volume 5 of the Waco Catalyst in which the laboratory supplies and chemicals marketed by Wilkens-Anderson Co., 111 N. Canal St., Chicago, Ill., are illustrated and described is now off the press.

Print plainly in filling out coupon for literature.

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